



Imperial Bureau of Plant Genetics

(For Crops other than Herbage)

Plant Breeding Abstracts

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Note.—Initialled abstracts are written by the following:

Mr H. O. Hartley	H. O. H.
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Dr J. Wishart	J. W.

* General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. VIII, No. 1.

Part 1. Empire Section

STATISTICS 519

1. BARTLETT, M. S. 519.24
Sub-sampling for attributes.
Suppl. J. Roy. Statist. Soc. 1937 : 4 : 131-35.

A method is described whereby an exact solution of the estimation problem has been reached through observation of a sample from a finite batch or "population". In the case of a non-measurable character or attribute it is shewn how we may calculate an interval to be assigned to p , the unknown probability, such that our prediction for p has a fiducial error not less than a known amount. The case of sub-sampling for attributes is discussed, and exact and approximate formulae given for the calculations needed.

J. W.

2. PITMAN, E. J. G. 519.24
Significance tests which may be applied to samples from any populations.
Suppl. J. Roy. Statist. Soc. 1937 : 4 : 119-30.

By considering the possible separations of $m + n$ numbers into two lots of size m and n respectively, and relating this to the actual occurrence of two samples of observational data of these sizes, the author is led to a test of the significance of the difference between their means which is independent of any assumption as to the nature of the population law. It is shewn that fiducial limits can be determined for the difference of means of populations of the same form, no matter what the form may be. The test given in this paper will frequently, in practice, reduce to the t -test.

J. W.

3. SAVUR, S. R. 519.241.5
The median as a statistic.
Curr. Sci. 1937 : 5 : 419-21.

By using a formula for the chance that not more than l values in a sample of n values are less than the median, the author is led, by fixing his chance at, say, 0.05, to find values within which the true median may be expected to lie, on this level of significance. Tests of significance are derived by this method and are considered to have advantages over the customary tests with means.

J. W.

BREEDING 575

4. BELL, G. D. H. 575:633
The art and science of plant breeding.
Agric. Progr. 1937 : 14 : 126-35.

The author reviews the relation of cytology and genetics to plant breeding and shews that they have some influence on the methods used by the plant breeder. He concludes, however, that plant breeding, depending for its success on the judgment, experience and skill of the breeder, is still largely an art.

5. 575:633(51)
BATHGATE, H. N. 581.143.26.03:633.11
China's scientific agriculture. System, research, and progress.
Fertil. Feed. St. J. 1937 : 22 : p. 277.

The article includes a brief account of the breeding work on wheat (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 938), cotton and potatoes, and mentions positive results obtained in vernalizing winter wheat.

GENETICS 575.1

6. HILL, A. G.
575.12:578.08:581.162.3

A note on the method for emasculating sugar-cane flowers by means of an aspirator.
Trop. Agriculture, Trin. 1937 : 14 : p. 128.
 The method of using the suction of a car intake for emasculation (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 467) is applicable to sugar cane.
7. HALDANE, J. B. S.
575.14:519.2

Some theoretical results of continued brother-sister mating.
J. Genet. 1937 : 34 : 265-74.
 The problem investigated is similar to that treated in an article already reviewed (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 515). The present author develops general formulae.

AGRICULTURE 63

8. HALL, A. D.
63.00.15(42)

The work of the National Institute of Agricultural Botany.
J. Nat. Inst. Agric. Bot. 1937 : 4 : 224-30.
 Among the lines of work mentioned, those relating to breeding are the multiplication and introduction to the public of new varieties, the careful testing of varieties and the testing of potato varieties for resistance to wart disease at the Ormskirk sub-station. Investigations into synonyms in potato varieties are also carried out at Ormskirk and in connexion with the observation plots of varieties of cereals and other crops apparent synonyms are reported. The Institute also is responsible for the seed testing for the Ministry of Agriculture and is considering taking up trials of new crops for English farmers.

FIELD TESTS 631.421

9. COCHRAN, W. G.
631.421:519.24

Problems arising in the analysis of a series of similar experiments.
Suppl. J. Roy. Statist. Soc. 1937 : 4 : 102-18.
 The statistical analysis of a number of replicated trials carried out at each of a number of centres or seasons is discussed, the problems considered being the estimation and test of significance of the mean treatment effect and of its variation from centre to centre. If the estimates are all equally accurate the analysis of variance procedure is appropriate. Otherwise a weighted mean is suggested as a suitable estimate of the average treatment effect in the absence of any variation in this effect from centre to centre. With a small number of degrees of freedom an alternative method is provided. When the variation in treatment effect is not assumed non-existent, it is shewn that the unweighted mean should be used.
J. W.
10. GOULDEN, C. H.
631.421:519.24

Efficiency in field trials of Pseudo-factorial and Incomplete Randomized Block methods.
Canad. J. Res. 1937 : 15 : Sect. C : 231-41.
 Comparisons of the efficiency of Incomplete and Complete Randomized Block arrangements of field experiments were made by studying uniformity trial data, the comparisons being made in 26 different ways. In general the Incomplete Block method gives increases in efficiency, these being partially correlated with soil heterogeneity. With a very uniform field there may be a loss in efficiency, but with careful planning and on the average field this is rather unlikely. From 20 per cent to 50 per cent increase in efficiency may on the average be expected, and the use of the Incomplete Block method can be recommended, especially in view of its greater adaptability to irregularly shaped fields. In relation to the size and shape of plots and blocks, the Incomplete Block method is found to give the greatest gain in efficiency when the Incomplete Blocks are nearly square and are made up of long narrow plots.
J. W.

11. HUTCHINSON, J. B. and PANSE, V. G. 631.421:519.24
An examination of an analysis of a serial experiment.
 Agric. Live-Stk. India 1937 : 7 : 332-38.

The data of a series of trials of 13 varieties of oats, carried out over three seasons at two centres, and previously analysed by Bose, are re-examined in relation to (1) the validity of a combined analysis and (2) the correct method of combined analysis, assuming its validity. It is further shewn that conclusions can be drawn from the separate component trials with almost as much confidence as from the combined analysis. J. W.

WHEAT 633.11

12. 633.11:575(93.1)
Address by Dr. F. W. Hilgendorf. The work of the Wheat Research Institute.
 Rep. Coun. Mtg., Annu. Mtg. and Annu. Conf. 1936. Roy. Agric. Soc. N.Z.
 1936 : No. 17.

Among the breeding accomplishments of the Wheat Research Institute mentioned are Cross 7, a wheat derived from a cross between Solid Straw Tuscan and White Fife and the new spring wheats Tainui and Taiaroa, developed by selection in some wheat received from Portugal. Tainui is intended for Canterbury and Taiaroa for Southland.

13. McMILLAN, J. R. A. 633.11:575.11-181.13
Investigations on the occurrence and inheritance of the grass clump character in crosses between varieties of *Triticum vulgare* (Vill.).
 Bull. Coun. Sci. Industr. Res., Aust. 1937 : No. 104 : Pp. 68.

The frequent occurrence of grass clumps (dwarfs) in crosses between wheat varieties, interfering with the genetical work at Canberra, made an examination of the problem necessary. In the present investigation, 97 varieties of *T. vulgare* were used, 945 different crosses being made. The crosses could be divided into three groups according to whether they produced grass clumps in F_1 , produced normal in F_1 and segregated into normals and grass clumps in F_2 or produced only normals in F_1 and F_2 . Occasional grass clumps occurring in a family otherwise normal or occasional normals in a family otherwise all grass clumps were interpreted as strangers or due to natural cross-pollination.

The following factors are postulated to explain the results: *G*, a dominant factor for grass clumps; *I*, a dominant inhibitor of *G*; *A* and *B*, complementary inhibitors of *I*. Both *A* and *B* must be present before the inhibitory action of *I* on *G* can be prevented. The factor pairs *B-b* and *I-i* are absolutely linked in the repulsion phase. On the above hypothesis five classes of varieties are to be distinguished, their formulae being as follows: class I *AbIG*, class II *ABig*, class III *abIG*, class IV *aBig* and class V *-bIg*; from the data available it could not be decided whether class V varieties carry *A* or *a*.

In many crosses evidence was obtained of reduced viability of grass clumps as compared with normals. The grass clumps obtained in different crosses differed in size, probably because of modifying factors. The smaller clumps are weak and probably easily killed.

The hypothesis was applied to the results of further crosses and back-crosses and gave for the most part satisfactory explanations. The data of other workers on this problem could also be explained in accordance with it.

Varieties can be classified into classes I to V according to their F_1 behaviour when crossed with varieties of classes I, II, III and IV. Thus class I varieties give grass clumps when crossed with II and IV only, class II with I and III only, class III with II only, class IV with I only and class V with none.

14.

GFELLER, F.

633.11:575.11"793":581.46

633.11-2.451.3-1.521.6:575.11

Inheritance of earliness of heading and other characters in a Garnet x Red Fife cross.

Sci. Agric. 1937 : 17 : 482-91.

The early, awnletted, bunt-resistant variety Garnet was crossed with the late, apical awned, bunt-susceptible variety Red Fife.

The F_1 was intermediate in earliness and in F_2 a uni-modal distribution was obtained, whether the plants were grown in the greenhouse or the field. It was possible to select early F_3 lines in F_2 , but the earliness of the Garnet parent was not recovered completely.

Resistance to bunt (*Tilletia tritici* and *T. laevis*) was found to be conditioned by a single main dominant factor, and was inherited independently of awns (Cf. "Plant Breeding Abstracts", Vol. III, Abst. 559).

The segregation for awns in F_2 gave a good fit to a dihybrid ratio of 5 awnless: 5 apical awned: 5 awnletted: 1 awned. The genotypes assigned to the parents are Garnet $B_1B_1b_2b_2$ and Red Fife $b_1b_1B_2B_2$. The F_1 ($B_1b_1B_2b_2$) and the new type $B_1B_1B_2B_2$ are awnless, while $b_1b_1b_2b_2$ is awned; in the remaining genotypes, if there are more B_1 factors than B_2 the plant is awnletted and if there are more B_2 than B_1 factors it is apically awned. It was possible to select early, intermediate and late lines in each awn class.

15.

BOYES, J. W. and

THOMPSON, W. P.

633.11:575.127:581.483

The development of the endosperm and embryo in reciprocal interspecific crosses in cereals.

J. Genet. 1937 : 34 : 203-27.

Embryo and endosperm development during the first 21 days after pollination are described in the following crosses and their reciprocals: *Triticum vulgare* ($n = 21$) x *T. durum* ($n = 14$), *T. vulgare* x *T. dicoccum* (Khapli, $n = 14$), *T. vulgare* x F_1 (*vulgare* x *durum* and *vulgare* x *dicoccum*), *T. spelta* ($n = 21$) x *T. monococcum* ($n = 7$) and *T. vulgare* x *Secale cereale* ($n = 7$). The object of the studies was to investigate the cause of the different success of reciprocal crosses between species of different chromosome numbers.

Abnormalities of different kinds were found in the endosperm in crosses in which the species with the higher chromosome number was used as the pollen parent. The abnormal areas were most abundant in the antipodal region and near the embryo and increased in frequency and extent with the degree of incompatibility of the parents. In the crosses made in the opposite direction abnormalities were for the most part absent and were not extensive even in the widest crosses. When the many-chromosome species was pollen parent the increase in size of the endosperm is more rapid than in the parents, but is accompanied by delayed and slower formation of cells, starch and aleurone as well as the abnormalities already mentioned. The rate of increase was less than in the parents when the cross was made with the many-chromosome species as seed parent.

In contrast to the conditions in the endosperm the development of the embryo was for the most part normal.

Owing to the functioning of aneuploid embryo sacs in the back-cross pentaploid F_1 x *T. vulgare* the conditions in the endosperm were very variable. The back-cross *T. vulgare* x F_1 on the other hand gave mostly normal conditions as aneuploid pollen grains do not as a rule function. The reason for the difference in success between the reciprocal crosses apparently lies in the development of the endosperm and any explanation must include the factor chromosome unbalance.

In the crosses *T. vulgare* var. Chinese x *S. cereale* and *T. vulgare* var. Marquis x *S. cereale*, the former being successful and the latter not, it was found that the germination of pollen was very different; rye pollen gave 60 per cent germination on stigmas of Chinese and only 10 per cent on stigmas of Marquis. There was no evidence that fertilization occurred in the cross with Marquis, nor in the reciprocal cross with Chinese.

16. KADAM, B. S. and KULKARNI, R. K. 633.11:575.127.2:575.11
Genetics of the Bansi wheat of the Bombay-Deccan and a synthetic Khapli—Part II.
 Proc. Indian Acad. Sci. 1937 : 5 : Sect. B : 169–82.
 Further data on the cross Bansi x Kala-Khapli 568, (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 843).
 Anthocyanin pigmentation of the plant, as in Kala-Khapli 568 is caused by a single, dominant gene *A*, the recessive, present in Bansi, producing a plant which is colourless except in the ligule and auricles.
 The fragile rachis of Kala-Khapli 568 is produced by a single, dominant factor *T*, the tough rachis of Bansi being recessive. Modifying factors are also operating.
 The earliness of Bansi was found to be inherited as a simple dominant character, though here again modifying factors were operating and F_3 families earlier than Bansi were obtained. All the late plants obtained in F_2 bred true. The gene concerned is named *E*.
 All three factors, *A*, *T* and *E* were found to be independently inherited.
17. KOSTOFF, D. 633.11:575.127.2:576.354.4
 633.11:575.127.5:576.354.4
Chromosome behaviour in *Triticum* hybrids and allied genera. I. Interspecific hybrids with *Triticum Timopheevi*.
 Proc. Indian Acad. Sci. 1937 : 5 : Sect. B : 231–36.
 An extensive list of hybrids obtained involving *T. Timopheevi* ($n = 14$) is given. The cytological data support the conclusion that the genom formula of this species is $AA\beta\beta$ (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 403) and that the *A* and β genomes shew no homology with the *V* genom of *Haynaldia villosa*, the *S* genom of *Secale cereale* or the *C* genom of hexaploid wheats.
18. KOSTOFF, D. 633.11:575.127.2:576.356.7:576.356.2
Formation of a quadrivalent group in a hybrid between *Triticum vulgare* and a *Tr. vulgare* extracted derivative.
 Curr. Sci. 1937 : 5 : p. 537.
 A *vulgare* segregate with $2n = 42$ chromosomes, extracted from a *vulgare-monococcum* hybrid was crossed with a normal *T. vulgare* and at the first metaphase of meiosis in the resulting hybrid a chain of four chromosomes was observed, usually arranged disjunctionally.
 The explanation advanced is that chiasma pairing had occurred between a chromosome of the *B* genom and one of the *C* genom while these two genomes were present in the haploid condition in the *vulgare-monococcum* F_1 hybrid. The resulting crossing-over would produce segmentally-interchanged chromosomes and a chain of four would be obtained on back-crossing to a normal *T. vulgare*.
19. HARRINGTON, J. B. 633.11–2.452–1.521.6:575.127.2
 633.11 Thatcher
Thatcher wheat.
 Circ. Coll. Agric. Univ. Saskatch. 1937 : No. 636 : Pp. 2. (Mimeographed).
 Data are given on the performance of the new rust resistant wheat Thatcher (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 621) in Saskatchewan. It is now recommended for most of the cereal zones of the province.

OATS 633.13

20. ELLISON, W. 633.13:576.356.5:581.331.2
Polyploid gamete formation in diploid *Avena* hybrids.
 J. Genet. 1937 : 34 : 287–95.
 The material studied consisted of segregates from a cross between *A. brevis* ($n = 7$) and another, unnamed *Avena* species with $n = 7$.
 Three methods are described whereby pollen grains with more than the haploid complement are produced. In the first and the most common method, pollen mother cells were cut off

in the archesporial tissue with more than one nucleus. The nuclei fused during the prophase of meiosis and first metaphase plates with 14, 21 or 28 bivalents were produced. The course of meiosis was otherwise normal and the end result was the production of giant pollen grains. The second method involved the failure of wall formation after the first division of meiosis, leading to fusion of the second metaphase plates and the production of a dyad. The third method consists of complete failure of wall formation during meiosis, the pollen mother cell producing one pollen grain with four nuclei.

BARLEY 633.16

21. PETO, F. H. 633.16:575.243:581.036
Genetical studies on mutants in the progeny of heat-treated barley.
 Canad. J. Res. 1937 : 15 : Sect. C : 217-29.

Seed of O.A.C. 21 barley was treated at 85° C. for 105 and 115 minutes. Ten different mutant characters were observed in the progeny, two types of xantha, four types of dwarf, two virescent types, chlorina and albino. As the mutations did not affect the whole plant in the treated generation, Mendelian ratios were not obtained in the F₁ but in the second and third generations good fits to mono- or dihybrid ratios were obtained. Chlorina, dwarf and one of the xantha types gave 3 : 1 segregation while the other xantha and albino both gave 15 : 1 and 3 : 1 in different lines.

One of the virescents made its appearance in the treated generation and is inherited maternally. The other appeared in a later generation and seems to be similar to the first.

Field populations of O.A.C. 21 barley were examined to compare the frequency of the different mutants in the absence of heat treatment. The conclusion is reached that the heat treatment increased the frequency of xantha mutants but not of albinos. No dwarf or chlorina mutants were observed.

22. HOPKINS, R. H. and BISHOP, L.R. 633.16-2.111-1.521.6:575
Record and summary of the investigations on barley carried out at Rothamsted, 1923-1933.
 J. Inst. Brew. 1937 : 43 : 283-87.

Inter alia, in view of the advantages to be obtained from winter sowing, the breeding of a winter-hardy, two-rowed variety, giving good quality is mentioned as a desirable objective.

MILLETS AND SORGHUMS 633.17

23. RANGASWAMI AYYANGAR, G. N. and HARIHARAN, P. V. 633.171:575.11-181.13
Inheritance of height of plants in the Italian millet—*Setaria italica* (Beauv.).
 Madras Agric. J. 1937 : 25 : 141-43.

A case of monofactorial inheritance of height in Italian millet is reported, tallness being dominant. The tall plants had about the same number of internodes as the short ones, but the internodes and the heads of the tall plants were longer and they had a correspondingly greater number and weight of grains.

24. SAINI, H. R. 633.174:575(54.5)
 633.174 J.S. 20
 633.174 J.S. 21
Improved fodder juars.

Seasonal Notes Punjab Agric. Dep. 1937 : 15 : 33-35.

Brief accounts of the character and performance of the non-sweet type J.S. 20, and the sweet type J.S. 21 are given. Both were selected in the Punjab.

25. RANGASWAMI AYYANGAR, G. N. and
VENKATARAMANA REDDY, T. 633.174:575.11.061.6
Chlorophyll deficiencies in sorghum—xantha and patchy albino.
Proc. Indian Acad. Sci. 1937 : 5 : Sect. B : 183–85.

The xantha type, found in a progeny of *S. coreaceum* Snowden, from Northern Rhodesia, is due to a single recessive factor y_x . Xantha seedlings usually die in eight to ten days. The patchy albino, which is phenotypically distinct from "zebra", occurred in a South Indian variety belonging to *S. Roxburghii* var. *hians* Stapf and in a race of *S. elegans* (Koren) Snowden from Tanganyika. The single recessive gene responsible is designated al_p .

26. RANGASWAMI AYYANGAR, G. N. and
KUNHIKORAN NAMBIAR, A. 633.174:575.114.4
The relationship between the mechanical tissue brown factor and the factor for juiciness of stalk in sorghum.
Madras Agric. J. 1937 : 25 : 157–58.

Independent segregation is reported for the two factor pairs Mt_B-mt_b (colourless—brownish purple mechanical tissue) and $D-d$ (pithy—juicy stalks).

27. RANGASWAMI AYYANGAR, G. N.,
PANDURANGA RAO, V. and
VENKATARAMANA REDDY, T. 633.174:581.46:575.11
The inheritance of deciduousness of the pedicelled spikelets of sorghum.
Curr. Sci. 1937 : 5 : 538–39.

Shedding of the pedicelled spikelets in sorghum has been found to be due to a simple recessive factor sh_1 .

28. RANGASWAMI AYYANGAR, G. N. and
PONNAIYA, B. W. X. 633.174:581.46:575.11.061.6
The occurrence and inheritance of purple pigment on the glumes of sorghum close on emergence from the boot.
Curr. Sci. 1937 : 5 : p. 590.

A single dominant factor G_{ep} is responsible for the turning purple of glumes immediately after emergence from the boot in some Nigerian sorghums belonging to *S. guineense* Stapf and *S. caudatum* Stapf. It is inherited independently of the factor Q which determines whether the pigment is reddish (q) or blackish purple (Q).

RICE 633.18

29. POGGENDORFF, W. H. 633.18:575(94.4)
Improving our rice by selection, introduction and breeding. The Department's efforts.
Agric. Gaz. N.S.W. 1937 : 48 : 319–23, 328.

A general account of the breeding of rice varieties for New South Wales.

By pure line selection methods, strains of different degrees of earliness of the short-grain varieties Caloro and Colusa have been developed. Varieties have been introduced from other countries and it has been found that those from temperate regions are more useful than those from tropical parts. The medium-grain variety Blue Rose and the long-grain variety Edith have been acclimatized and are available for commercial distribution if required. Lady Wright Crossbred 13-3-1, a selection from a Lady Wright natural cross, represents a compromise in respect of grain quality and yield. Resistance to cracking is being sought in the introduced varieties. Artificial shortening of length of day is used to hasten the flowering of introductions.

A technique of hybridization which can be used at Yanco has been developed and it is considered that the greatest hope for future improvement lies in cross-breeding. Natural cross-pollination is very common and makes special precautions necessary in the propagation of pure lines.

Future work will be directed to the improvement and replacement of existing types rather than to the development of a multiplicity of varieties. It is hoped to institute a series of trial plots in co-operation with growers.

30. RAMIAH, K. 633.18:581.192.5:575.11
Scent in rice.

Madras Agric. J. 1937 : 25 : 173-76.

Some varieties of rice emit a characteristic scent when boiled. The scent can also be detected in the empty glumes and in the dehiscing anthers. This character is apparently inherited in Mendelian fashion, but owing to difficulties in scoring, the ratios obtained in crosses between scented and non-scented varieties were somewhat variable. In some families there was an approach to a ratio of 9 scented : 7 non-scented. A genetical association was detected between scent and the factor *r* for white rice.

31. KADAM, B. S., KALAMAR, R. J. and PATANKAR, V. K. 633.18-1.421:519.24
Estimation of rice yields by sampling.
 Curr. Sci. 1937 : 5 : 533-34.

It was found that sampling units of 3' x 3' taken from 33' x 33' plots of rice, three from each of three sub-plots, furnished 92 per cent of the total information. A detailed account of the experiment is to be published.

ROOTS AND TUBERS 633.4

32. MORRIS, L. E. and RICHHARIA, R. H. 633.42:575.127.5:635.15:576.356.5
A triploid radish x turnip hybrid and some of its progeny.
 J. Genet. 1937 : 34 : 275-86.

By pollinating *Raphanus sativus* ($n = 9$) by *Brassica rapa* ($n = 10$) two viable hybrids were obtained, one of which was a triploid with 28 chromosomes, having apparently arisen from a diploid egg cell.

The progeny obtained by open pollination included two hexaploids with $2n = 56$ approximately. Apparently most of the egg cells functioning in open pollination were triploid, but others had 9 chromosomes.

Judged by the size of the grains, the pollen of the triploid had chromosome numbers ranging from 9 to 28, but when it was used to pollinate radish it was chiefly the 9-chromosome grains which effected fertilization. A plant was obtained with 19 chromosomes from this back-cross, but the extra chromosome, which did not pair at the first meiotic division and is probably a turnip chromosome, did not appear to affect the external characters of the plant, which was identical with radish except for its reduced fertility. No plants with more than 19 chromosomes were found in this back-cross progeny and it appears that triploid pollen cannot function on radish stigmas.

33. SALAMAN, R. N. 633.491(8)
The potato in its early home and its introduction into Europe.
 J.R. Hort. Soc. 1937 : 62 : 61-77 ; 112-23 ; 153-62 ; 253-66.

The author gives an account of the archaeological and historical data pertaining to the early cultivation of the potato, especially in Peru and Bolivia, tracing back the documented history to about A.D. 200. He considers that the potato must have been in cultivation for at least 3,000 years.

He quotes evidence shewing that it was cultivated in Europe, near Seville, as early as 1572, fifteen years earlier than the earliest date hitherto known. This was the result of the first introduction, *via* Spain. The second introduction was *via* England and he adduces evidence in support of the theory that Drake introduced it and Raleigh first cultivated it.

Contradicting the Russian workers, he maintains that these introductions were from the Peruvian region rather than the Chilean or the Island of Chiloe and suggests that the differences between *Solanum tuberosum* and *S. andigenum* are not sufficient to shew that the reverse is the case.

An interesting picture is given of the place of the potato in the lives of the South American natives before the Spanish conquest.

34. 633.491-2.412.5-1.521.6
633.491-1.521.5

Report of the Potato Synonym Committee on the potatoes sent for immunity trials to the Potato Testing Station, Ormskirk, Lancashire, 1935, 1936.

J. Nat. Inst. Agric. Bot. 1937 : 4 : 158-62; 163-67.

These two reports give the results of the tests for reaction to wart disease and for synonymity in potato varieties in 1935 and 1936.

FIBRES 633.5

35. RAMANATHAN, V. 633.51:575(54.8)
Annual report of the Cotton Breeding Station, Coimbatore, for the year 1935-36.

Pp. 25.

In the improvement of Cambodia cotton, selection and hybridization of Co.2 with South African cottons (U.4 etc.) and South American cottons (*G. purpurascens* and *G. barbadense*) is being pursued. Data are given on the yield of the selections tested.

Selection and hybridization are also carried on in the improvement of Salems, a mixture of Karunganni, Uppam and Nadam cottons.

Genetical studies have been made on pollen colour, seed and lint weights, boll opening, number of locules per boll, hybrid vigour, natural crossing and on certain characters induced by X-ray irradiation of seed.

The resistance of varieties of American and indigenous cotton to the stem weevil (*Pemphres affinis*) was tested. American types suffered less than indigenous ones, while among the American types Co. 2 was the most susceptible.

36. TROUGHT, T. 633.51:575(62.4)
Cotton growing and breeding in the Anglo-Egyptian Sudan.
Emp. Cott. Gr. Rev. 1937 : 14 : 197-205.

The history of cotton-breeding work in the Anglo-Egyptian Sudan since 1912 is outlined.

The work of the Plant Breeding Section is divided into two parts, concerned with Egyptian and American types respectively.

The first step in the work on Egyptian types was the testing of strains, including introductions of Sea Island and other strains. This work shewed the superiority of Sakel 186 and under normal conditions it would have replaced the ordinary main crop Sakel in the Gezira. The advent of leaf-curl disease, however, to which it is susceptible resulted in its being discarded and resistance to leaf-curl became an important objective in breeding work. Certain black-arm resistant strains bred by A. R. Lambert proved to be resistant also to leaf-curl and the immediate task of the breeders became the improvement of the lint qualities of these strains X 1530 and X 1730. Other lines shewing promise as leaf-curl resistant types are some derivatives of the earlier Sea Island types and selections from a heavy yielding Sakel strain; Ishan, from Nigeria, has been crossed with Sakel and Sea Island types in the hope of producing leaf-curl resistant forms with good lint qualities.

Selection for resistance to black-arm yielded little result but it seems possible to transfer the resistance of certain American types from Uganda to Egyptian types by Harland's back-cross method.

The work on American cottons has consisted in the testing of strains and selection. The cotton

513, introduced from the Punjab is early maturing enough to yield a crop before pink bollworm destroys it and may offer a solution to the pink bollworm problem in the Berber pump schemes, where this pest was making cotton growing almost impossible. Among other strains, one of the hybrids sent out from Trinidad, with the parentage (Cambodia x U.4) x Cambodia is mentioned as shewing great promise.

37. HARLAND, S. C. 633.51:575.127.2:575.11.061.6

Three genes in a wild species of cotton. (*G. Armourianum* Kear.).

Trop. Agriculture, Trin. 1937 : 14 : p. 156.

A plant of the American diploid species *Gossypium Armourianum* Kearney ($2n = 26$) was crossed with a type of *G. barbadense* ($2n = 52$) with three recessive characters, cream corolla, cream pollen and no petal spot. The *Armourianum* parent had yellow corolla, yellow pollen and strong petal spot. In the F_1 1 : 1 segregation was observed for each of these characters shewing that the *Armourianum* parent must have been heterozygous in respect of each of them. The three characters were inherited independently. The *Armourianum* genes are designated Y^{AR} (yellow corolla), P^{AR} (yellow pollen) and S^{AR} (petal spot).

38. HUTCHINSON, J. B. and 633.51:575.242

GHOSE, R. L. M.

633.51:575.115:575.113.5

On the occurrence of "crinkled dwarf" in *Gossypium hirsutum* L.

J. Genet. 1937 : 34 : 437-46.

The crinkled dwarf mutant has been observed in the Sea Island cotton (*G. barbadense* L.) and studied by Harland (Cf. "Plant Breeding Abstracts", Vol. II, Abst. 545; Vol. IV, Abst. 558 and Vol. VI, Absts. 64 and 715). It also occurs in Egyptian cotton (*G. barbadense*) where it is known as "wrinkled leaf", but so far had not been observed in Upland cotton (*G. hirsutum*). It was found in the *hirsutum* strain Indore 1 by the authors and gave 3 : 1 segregation. Crossed with Egyptian "wrinkled leaf" Indore crinkled gave a strongly crinkled F_1 and a wide range of forms in F_2 , from normal to heavily crinkled. The expression of the character varies with the age of the plant and the proportion of crinkled plants increased with the age of the F_2 , but even at the last count there were still some apparently normal plants and these correspond to Harland's pseudo-normals (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 64). It may therefore be concluded that Indore crinkled is due to a mutation at the same locus as in Egyptian "wrinkled leaf" and Sea Island crinkled.

The finding of this mutant in *G. hirsutum* answers one of Harland's objections to Fisher's theory of the evolution of dominance by selection among heterozygotes and the authors shew that in other respects their observations are in accord with Fisher's theory and, while not inconsistent with Harland's theory of selection of modifiers on their own account, provide no support for it. They suggest that the evolution of dominance of the normal allelomorph of crinkled has been completed during the last century, having been aided by modern methods of cultivation which make for less marked differences in viability in the seedling stages, which according to Fisher results in more rapid improvement, and also by the cultivation of annual types, compressing several generations into the time formerly occupied by one. It would be expected, therefore, that transference of crinkled from annual to perennial, more primitive types of *G. barbadense* would result in the breakdown of dominance. Moreover, since annual types have been in cultivation longer in *G. hirsutum* than in *G. barbadense*, the improvement of crinkled should have proceeded further in the former species. This is in fact the case and even the homozygous crinkled is considerably less abnormal than Egyptian "wrinkled leaf"; under field conditions in Rajputana it grew sufficiently well to increase until it comprised 3 per cent of the crop.

39. KUMAR, L. S. S. 633.51:581.162.51:576.354.4:575.242

Sterility in cotton.

J. Univ. Bombay 1937 : 5 : Pt. 5 : (Biol. Ser. No. 5) : 1-18.

Six or seven completely sterile plants occurring spontaneously in the cotton variety 1027 A.L.F. (*Gossypium herbaceum*) were studied cytologically.

The pollen grains were very varied in size and only about 20 per cent had protoplasmic contents.

The plants produced a high proportion of abnormal tetrads: they were completely sterile on both male and female sides.

Meiosis in the pollen mother cells was apparently regular until diakinesis. Here univalents and multivalents appeared as well as bivalents and more than the normal 26 chromosomes were present in some cells. Lagging of chromosomes was very common at both anaphases and at second metaphase more than two spindles were often present.

The origin of the plants is ascribed to a mutation affecting one boll on a single plant in the preceding generation.

Although the plants normally do not set a single boll, when propagated by grafting one single boll with a few seeds was obtained by open pollination. The single plant obtained from these seeds differs from the parent in many morphological characters and is highly fertile.

40. LUTHRA, J. C. 633.51:581.49:576.356.5
A note on hairiness in the Punjab cottons.
 Curr. Sci. 1937 : 5 : 595-96.

Hairiness of the leaf is an important character in the American types of cotton grown in the Punjab in that the glabrous types are severely attacked by insects.

Measurements have shewn that the Punjab American types have longer hairs than indigenous types but that the latter have more hairs per square cm. Among the American types 1, 43, 4-F and 4-F(S) have more hairs than the rest.

The American types have thicker leaves than the indigenous types.

41. HANCOCK, H. A. 633.51:677.1(62)
Strength, grade and price of Egyptian cottons.
 J. Text. Inst., Manchr. 1937 : 28 : T177-87.

The technological characteristics of cotton varieties cultivated in Egypt are given, including some of the newer varieties.

42. HUTCHINSON, J. B. and
 PANSE, V. G. 633.51:677.1:578.081
On an attempt to use hand-spinning for testing quality in cotton.
 Agric. Live-Stk. India 1937 : 7 : 339-46.

In the hope of developing a more reliable method for testing the spinning qualities of small quantities of fibre than testing such hair characters as mean hair length and mean hair weight, experiments were carried out on hand spinning, using two Indian instruments, the takli and the charkha. It was found that there was no agreement between the data for hand spinning and those obtained from machine spinning and it is considered that the method is of no value in estimating the quality of cotton for mill use.

SUGAR PLANTS 633.6

43. H. M. L. 633.61:575
The role of the plant breeder.
 Int. Sug. J. 1937 : 39 : 293-95.

An article explaining in non-technical language the aims and methods of the sugar-cane breeder and suggesting the application to sugar-cane of inbreeding and subsequent crossing, as used in maize breeding.

44. 633.61:575(68)
Sugar Association Annual Meeting.
 S. Afr. Sug. J. 1937 : 21 : 327-37.

In a brief summary of the work of the South African Sugar Association's Experiment Station is mentioned the work on variety trials, importation of new varieties and also the raising of seedlings from imported seed of promising crosses such as P.O.J. 2725 x Co. 281 and P.O.J. 2878 x Uba Marot.

45. 633.61:575.252
Experiment Station notes.
 S. Afr. Sug. J. 1937 : 21 : p. 287.
 A collection of bud sports from different varieties of canes was planted. Some of the sports have maintained their distinguishing characters, others have varied still further and yet others have grown true to the type of the original variety.

46. 633.63:575
 HINCHCLIFF, J. H.
Sugar beet seed.
 B.G.A. Rec. 1937 : No. 1 : 30-31.
 A brief account is given of the early development of sugar beet growing and of the methods of breeding and seed production. The variety trials carried out in the Irish Free State are also mentioned.

47. 633.63:575(47)
Production of beet seed in the Soviet Union.
 Brit. Sug. Beet Rev. 1937 : 10 : 339-40.
 A brief account of the organization of sugar beet seed selection and production in the U.S.S.R.

STIMULANTS 633.7

48. 633.71:575(68.9)
 BRAIN, C. K.
Report of the Tobacco Research Board for the year ending December 31st, 1936.
 Rhod. Agric. J. 1937 : 34 : 277-308; 404-25.
 Contains the report of the tobacco plant breeder, Southern Rhodesia (Cf. also "Plant Breeding Abstracts", Vol. VII, Absts. 449 and 870).
 Morphological and curing studies on individual plants have indicated that there are considerable variations within a variety, some at least being genetic; it therefore should be possible to obtain a more standardized and considerably improved strain or variety by selection based on these criteria. The most obvious differences within a variety were those based on ruffle size and three types have been distinguished, narrow, wide and intermediate. The differences in ruffle size are associated with differences in habit and leaf shape.
 Selections have been made from the varieties shewing definite promise and mass selections from the less promising varieties. Practically all the varieties imported last year as well as the progenies of the crosses Hickory Pryor x Warne and Hickory Pryor x Cash have been discarded.
 The mosaic-resistant variety Ambalema has been crossed with good varieties with the object of transferring its resistance to them. Other crosses between varieties of proven value have been made to provide greater diversity for selection.
 Cytological studies have indicated that some of the variations observed in tobacco varieties are due to cytological aberrations; this work is to be continued during the winter months.
 The programme for 1936-37 consists of the continuation of previous work, a Latin square variety trial of seven varieties and selection for mosaic resistance in White Stem Orinoco and Jamaica Wrapper by artificial inoculation, in co-operation with the plant pathologist.

49. 633.73:576.356.5:575.252
 633.73:576.354.4:576.356.5
 633.73:575.127.2:581.163
 KRUG, C. A.
Cytological observations in *Coffea*. III.
 J. Genet. 1937 : 34 : 399-414.

In progenies of normal tetraploid ($2n = 44$) individuals of *C. arabica* L. (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 264) there frequently occur plants belonging to *C. arabica* var. *Bullata* Cramer, distinguished by thick leathery leaves and certain other characters. These *Bullata* plants are octoploid ($2n = 88$). They sometimes occur as bud sports and it is considered that their origin is in general due to somatic doubling rather than to unreduced gametes.

Meiosis in the pollen mother cells of these octoploids was found to be irregular, univalents, bivalents and trivalents being found at first metaphase and diakinesis; abnormalities were observed at anaphase also and the "tetrads" produced were often irregular, only 62 per cent having four cells. The fruits produce few seeds, 29 per cent of the ovules degenerating completely. Only 26 per cent of the seeds found had the normal quantity of nutritive tissue and the germination of apparently normal seeds was very low. Most of the seedlings obtained, partly from artificial selfing, were tetraploid, one was hexaploid and one octoploid. No aneuploid plants have been obtained. Seven seedlings obtained from the cross tetraploid x octoploid had 44 somatic chromosomes. None were obtained from the reciprocal cross.

Tetraploid shoots occur as bud sports on *Bullata* plants and it is pointed out that since these tetraploid shoots are like normal *C. arabica* in every respect, including fertility, the 88 chromosomes of *Bullata* must have been exactly halved qualitatively as well as quantitatively.

Another type of *Bullata* plant, differing from the normal tetraploids in the same way but in less degree than the octoploids, is hexaploid. Such plants are believed to arise by the union of a reduced and an unreduced gamete and are much rarer than the octoploids. Meiosis in the pollen mother cells was again irregular and only 70 per cent of apparently normal tetrads are produced. Of the seeds produced, 27 per cent were apparently normal, but such seeds had a very low germination percentage. So far only four seedlings from a hexaploid plant have been examined; three were hexaploid and one tetraploid.

A triploid hybrid was obtained from the cross *C. arabica* ($2n = 44$) x *C. canephora* ($2n = 22$). In other interspecific crosses between parents with different chromosome numbers, a few plants were obtained with the chromosome number of the female parent. If these plants are produced by parthenogenetic development of the egg followed by somatic doubling, completely homozygous plants of great value for genetical work can be obtained.

50. VOELCKER, O. J. 633.74:581.162.52(72.98)

Self incompatibility in cacao.

6th Ann. Rep. Cacao Res. Trinidad (1936) 1937 : 2-5.

Data are presented to shew that while some of the Imperial College Selection trees are self-compatible, others are self-incompatible. It is suggested that self-incompatibility may be a limiting factor in yield and may in large part be the cause of the lower yields obtained in Trinidad as compared with West Africa. It is also important with respect to quality, for cacao exhibits xenia in the commercial product, the bean.

51. SALMON, E. S. 633.79:575(42)

"Early Promise", a new variety of hop.

J. S.-E. Agric. Coll., Wye 1937 : No. 40 : 37-43.

A description is given of the new variety Early Promise, which has hitherto been known under the reference number X35. It was bred at Wye College from a cross between a hop of unknown origin, D9, and a British male hop, B1. It shews considerable resistance to downy mildew and is an immune carrier of mosaic disease. From the brewing point of view it is recommended as a copper hop or for use in a blend.

RUBBER PLANTS 633.91

52. GRANTHAM, J. 633.912:575

Research in the cultivation and preparation of raw rubber.

J. R. Soc. Arts 1935 : 83 : 1051-68.

The article includes a brief account of breeding work with *Hevea*, covering clonal selection and seed selection.

53. MURRAY, R. K. S. 633.912:581.165:575

Report on a visit to Malaya, Java and Sumatra.

Bull. Rubb. Res. Scheme, Ceylon 1937 : No. 54 : Pp. 46.

In the section on planting material the author gives data to shew the advantages to be derived from using bud-grafts of tested clones of *Hevea*, answers certain objections which have been raised and also discusses the use of different types of clonal seed. Notes on the characteristics of different Malayan, Sumatra and Java clones are given.

FRUIT TREES 634

54. TYDEMAN, H. M. 634.11-1.541.11:575:581.43
The root systems of some new varieties of apple rootstock.
 Ann. Rep. E. Malling Res. Sta. 1937 : (1936) : 87-91.

The rootstocks studied were propagated vegetatively from seedlings obtained by crossing Malling No. VIII (French Paradise) and Malling No. IX (Jaune de Metz). They differed chiefly in the amount of fibre (roots less than 2 mm. in thickness) and in the distribution of fibre, which was confined to the upper part in some and distributed evenly over the whole system in others. It is considered that these differences are due to genetic segregation.

55. CRANE, M. B. and 634.23:581.162.52:575.11
 BROWN, A. G. 634.23:581.162.51
Incompatibility and sterility in the sweet cherry, *Prunus avium* L.
 J. Pomol. 1937 : 15 : 86-116.

The results of over 236,000 pollinations of cherries are described, those relating to named varieties being given in full. Self-incompatibility is the rule in sweet cherries and of 66 varieties tested, 45 fall into 11 intra-sterile, inter-fertile groups while 21 varieties remain independent.

Tests with seedlings indicate that self-incompatibility in sweet cherries is based on a series of oppositional, allelomorphic factors (S_1, S_2 etc.). To explain the 32 different types found, at least 9 incompatibility factors are required.

The average set obtained from compatible pollinations was about 22 per cent, but considerable variation occurs among the crosses, probably due in part to generational sterility. This factor was also evident in the proportion of good and germinating seeds and pollen grains.

The article concludes with some remarks on confusion in varietal nomenclature and on the interplanting of varieties.

VEGETABLES 635

56. BROWN, W. 635.346-1.535.6:575.73
A study of the deterioration of seakale stocks, with notes on some diseases of that crop.
 J. Pomol. 1937 : 15 : 69-85.

In seakale (*Crambe maritima* L.), propagated by root cuttings, deterioration occurs, making the stock unsuitable for forcing, unless selection for propagation is performed.

The author found that clones built up from good forcing plants did not deteriorate. He presents evidence to shew that deterioration is due to the fact that the bad forcing types have more vigorous root systems and so tend to increase, cuttings being taken from their roots in preference to those of the good forcing types. Deterioration will be prevented by roguing.

57. LANGFORD, A. N. 635.64-2.484-1.521.6:575.11
The parasitism of *Cladosporium fulvum* Cooke and the genetics of resistance to it.
 Canad. J. Res. 1937 : 15 : Sect. C : 108-28.

Study of the linkage relations of the factor for immunity to *Cladosporium fulvum* Cooke in tomatoes led to the discovery of additional types of resistance and of physiological specialization.

Four main classes of reaction to *C. fulvum* have been defined. These are complete susceptibility, two types of partial resistance, and immunity. Four physiological forms have been described on the basis of these reaction classes. Extensive cultural studies indicate that *C. fulvum* is composed of an indefinite number of physiological forms since many culturally distinct mutant forms have been isolated from a comparatively small number of original cultures.

Studies of *C. fulvum* in culture resulted in the production of as many as seven distinct saltant strains from one original culture obtained from a single-celled, uninucleate conidium. This

variability in culture is due to nuclear changes considered to be mutations, but it is not stated whether they are due to gene mutations or chromosome aberrations.

Inoculation studies revealed that symptoms developed later on the younger leaves of the plant than on the older ones. Thus the reaction of a leaf is determined by its physiological age. Studies on the influence of grafting combinations between different varieties indicate no departure from the normal reactions of the varieties involved.

The genetics of the three types of resistance are fully analysed, and special attention is paid to the resistance factors of the Red Currant tomato and of Stirling Castle. The studies of varietal reaction and of the inheritance of resistance to *C. fulvum* have involved three types of resistance. The genetic basis for the immunity of the Red Currant tomato has already been reported, but another type of resistance found in this variety and the type of resistance of Stirling Castle have been discovered.

Universally significant symbols to represent the dominant factors governing these three resistances have been selected, and it is hoped that other workers will employ this system of symbols if other resistance factors are discovered in the tomato.

The three resistance factors have been located in MacArthur's chromosome maps of the tomato.
F. M. R.

58. EKBOTE, R. B. 635.657:581.45:575.242
Mutations in gram *Cicer arietinum* L.
 Curr. Sci. 1937 : 5 : 648-49.

Two mutants occurring in the Pusa types 17 and 25 of *Cicer arietinum* and affecting leaf shape are described.

Part II. Foreign.

STATISTICS 519

59. OPSOMER, J. E. 519:24:633.18
Recherches sur la "méthodique" de l'amélioration du riz à Yangambi.
I. La technique des essais. (**Researches on the "methodics" of rice improvement at Yangambi. I. Technique of the trials**).
Publ. Inst. Agron. Congo Belge 1937 : Sér. Sci. No. 12 : Pp. 25.

R. A. Fisher's analysis of variance is compared with the classical method and it is shewn that the former alone is able to yield significant results. An example of the use of the new method is given and the results of uniformity trials are discussed.

BREEDING 575

60. COLLADO Q., C. 575:633
Mejoramiento de las plantas y ganado por medio de la selección. (**Plant and animal breeding by means of selection**).
Rev. Cent. Nac. Agric. Costa Rica 1937 : 2 : 92-103.

The importance of selection is illustrated with reference to coffee (where grafting of the best lines is recommended), maize, rice, potatoes and other plants and to domestic animals.

61. ALEKSANDROV, A. B. 575:633(47)
(**The All-Union Institute at a new stage**).
Selektcija i Semenovodstvo (Breeding and Seed Growing) 1936 : No. 11 : 8-12.

An outline of the recent work of the Institute of Plant Industry, Leningrad. Among the developments referred to are the success of the new wheat variety Khoranka, early, resistant to drought and to brown rust. Other selections from the wheats of Asia Minor are promising too, and some of the Chinese wheats are excellent in earliness, yield and resistance to brown rust. A promising drought and wind resistant wheat has been produced from a cross between *Aegilops* and *T. durum*. The 42 chromosome hybrid from *T. Timopheevi* x *T. monococcum* is particularly promising from the point of view of disease resistance. A new high-quality spring wheat exceeding Novinka in yield and named Ferrugineum ZA₇32 has been produced, and other selections and hybrids have also excelled Novinka in yield.

In barley several promising varieties have been produced by crossing distant geographical races. New varieties superior in earliness, drought resistance or other qualities have been produced in maize and sorghum and the new hybrids between sunflower and Jerusalem artichoke are of particular interest. Hybrids have been produced between sugar beet and the white Iranian beet and exceed the sugar beet variety by 10-15 per cent in yield without great inferiority in sugar content. A good silage sunflower has also been selected, also a turnip with 20 per cent greater yield of dry matter, a high-yielding flax resistant to lodging and fungous diseases, an earlier form of Egyptian cotton selected from Giza 12, and a lentil with non-splitting pods resistant to drought and diseases.

62. RUNOV, T. A. 575:633(47)
(**The best representatives of the diversity of varieties at the Soviet Agricultural Exhibition 1937**).
Selektcija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 1 : 9-11.

A brief account of the exhibition serves as the occasion of an enumeration of the best Soviet varieties of a great number of different crops.

63.

CHMELÁŘ, F.

575:633:007

633.16:575

Jan Vaňha a počátky zemědělského výzkumnictví a zúslachťování ječmene na Moravě. (**Jan Vaňha and the beginnings of agricultural research and of barley breeding in Moravia**).

Edited by the Czechoslovak Acad. Agric., Prague 1937 : No. 9 : Pp. 144.

An account of the life and work of Jan Vanha, late Director of the Landes-Versuchsstation für Pflanzenbau in Brno. Barley breeding, and Hanna barley in particular, was his special interest but his work included the improvement of sugar beet, wheat breeding and work on disease resistance in various crops.

64.

575:633:061.3

63.00.15(47)

(**Brief outline on the work of the 4th session**).

Bulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1937 : No. 1 : 20-26.

The fourth session of the Lenin Academy of Agricultural Sciences, devoted to breeding and genetics, was attended by more than 3,000 people. A brief account is given of the president's inaugural address and of the sessions. The subjects for discussion were limited to the results attained in the experimental production of new varieties of cultivated plants and races of domestic animals and each breeder described his productions. In addition to improved and more productive forms of many crops, special mention is made of the perennial wheats, hybrids of oats and barley showing heterosis, a barley giving two yields a year, very productive new high-quality cottons and others ripening 13 days earlier than the variety Schroeder, and bisexual hemp.

After the above papers came addresses and discussions on the fundamental principles and methods of genetics and breeding.

65.

575:633:061.3

63.00.15(47)

(**Fourth session of the All-Union Lenin Academy of Agricultural Sciences**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 2 : 2-47.

A report is given of the session, including photographs of the main contributors and résumés of their papers. These included V. Ja. Jur'ev on his cereal selections; A. I. Deržavin on perennial cereals; I. G. Eichfeld on the production of cereals and roots capable of growing in arctic conditions, mainly by phasic crossing, in potatoes by interspecific crossing; I. S. Kovalevskii on his wheat breeding, including the production of Ukrainka and Zarja; V. F. Judin on the production of naked oats and barley varieties; S. L. Sobolev on disease-resistant wheats; P. N. Konstantinov on herbage plants and interspecific crossing in wheat; A. L. Čaika on wheat selections; P. I. Lisitsyn on clover breeding; D. P. Ryžikov on the value of local strains of wheat in breeding for the Ukraine; F. N. Kuksenko on the rapid production of new wheat varieties by Lysenko's methods; N. K. Koltsov on vernalization of cocoons and genetics of the silk worm; V. V. Surovov on sweet clovers; E. M. Plaček on the production of disease-resistant and otherwise improved sunflowers by inbreeding and hybridization; L. A. Ždanov on the production of sunflowers resistant to both strains of *Orobanche cumana*; V. S. Pustovoi on the production of sunflowers with up to 50 per cent oil in the dried seeds; K. V. Maluša on hemp varieties with male plants that ripen simultaneously with the female plants and whose fibre is good for textile purposes; N. A. Belovitskaja on a monoecious hemp; S. S. Kanaš on cotton varieties, such as 8715, improved in quality and yield; E. N. Sinskaja on herbage plants; A. G. Sapoval on maize breeding; V. N. Lebedinskii on improved sugar beets; D. G. Lorkh on yield in potato hybrids; N. N. Košel'kova on high yielding wheat and other cereal selections; L. A. Slinin on flax selections resistant to rust and some also to *Fusarium*; P. F. Garkavyi on the production of two earlier, higher yielding barley varieties in 2½ years by application of the theory of phasic development; A. M. Favorov on Lysenko's method of planting potatoes

in the summer in the steppes to obviate degeneration; and G. K. Meister on the value of inbreeding in breeding work.

N. I. Vavilov spoke on the important role played by local strains in Soviet plant breeding and the value of the world collections for improving those by hybridization, in the assembling of which many new forms and even species have been discovered, some of which are of direct importance in Soviet breeding. Examples are given of valuable practical results accruing from the use of these forms in breeding. Insistence is made upon the value of inbreeding if properly applied and examples are given of varieties that have remained pure and have not degenerated over long periods of years. Among the successful results of distant hybridization are mentioned, in addition to the more familiar ones, the sunflower-artichoke hybrids and a new fruit obtained by crossing cultivated water melons with wild melons.

T. D. Lysenko opens his discussion by emphasizing the importance of Darwinism in genetical and evolutionary theory. He refers to the frequent degeneration of plants not subjected to selection and agrees with Darwin that continued self-fertilization is the cause. By cross-pollination the potentialities for adaptation of both parents are combined in the offspring whilst inbreeding has the reverse effect; Lysenko agrees with Darwin as to the non-existence of plants that are only self-pollinated. The 2-3 million plants of a field of any variety differ one from the other to a certain extent, though all conforming to the general characteristics of the variety. Crossing between these different forms will not only increase the adaptive potentialities of the progeny but level up these small differences, producing a more uniform progeny. Large-scale crossings between plants of a variety, effected by emasculating certain rows and allowing them to be pollinated by the wind, have been carried out by over ten thousand collective farm workers and the plants from the seed produced are more vigorous, have a higher tillering capacity and seem more hardy.

Lysenko also describes his experiments where by treating varieties with appropriate temperatures, etc. during their developmental phases their requirements in these respects are reduced or increased, the alteration being transmitted to the progeny.

A. S. Serebrovsky outlines the many important contributions of genetics to stock breeding. G. G. Muller gives a succinct account of the genetical standpoint and points out a number of well established facts which do not accord with Lysenko's theories.

The remarks of the various speakers in the discussion following the session are also reported briefly, together with G. K. Meister's summing up and the final address of the President.

66. 575:633:061.3
63.00.15(47)
*MEISTER, G. K.
(Summary of the discussion on genetics and breeding).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of
the Lenin Academy of Agricultural Sciences) 1937 : No. 1 : 4-19.

An impartial summing-up of the many controversial addresses given at the 4th Session of the Lenin Academy of Agricultural Sciences.

67. 575:633:061.3
63.00.15(47)
MURALOV, A. I.
(Summary of the 4th session).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin
of the Lenin Academy of Agricultural Sciences) 1937 : No. 1 : 1-3.

In summing up the discussion on the position of breeding work in the U.S.S.R. the President of the Academy states that though much has been achieved in the production of more productive or hardy races yet this has not been done at the rate desired, except by the Odessa Plant Breeding Institute, which should therefore serve as a model for the rest of the country. Breeders have not put their results to a sufficient extent into agricultural practice. To overcome this, agricultural science is urged to reorganize its work bringing it into line with "a Darwinian doctrine brought up to the level of Marxism."

* An abridged translation of this paper is on file at the Bureau.

68. HARRINGTON, J. B. 575:633:578.08
The mass-pedigree method in the hybridization improvement of cereals.

J. Amer. Soc. Agron. 1937 : 29 : 379-84.

The new method, adopted at Saskatoon, differs from the mass method in that individual plants are selected when the season is favourable for selecting for a given character. The progenies of these plants are grown separately the next year for progeny tests. Selection in this year may be of individual plants or of promising progenies, according to the seasonal conditions and the next year the selections are sown in bulk again.

69. (On the scientific work planned by the Institute of Plant Industry). 575:633.00.15(47)
 Bull. Appl. Bot. Leningrad 1936 : Ser. A (19) : 145-54.

A brief outline is given of the work of the Leningrad Institute of Plant Industry, its recent achievements and plans for future development in the various departments. Various defects and omissions in the previous work of the Institute are pointed out, the most serious being an insufficient attention to the practical aspect of plant breeding and to the diffusion of the results among the collective farms. These defects it is hoped to remedy in the future; and the breeding work is to be accelerated by growing more generations per year and the number of projects is being materially reduced.

GENETICS 575.1

70. CUGNAC, A. de 575.1:576.312
 Tendances et possibilités actuelles de la génétique végétale. (Trends and present possibilities in plant genetics).
 Ann. Sci. Nat. 1937 : 19 : Sér. 10 : 113-24.

Considerations are presented with reference to chromosome studies made by cytological methods and by experimentation on the action of various agents on the cell, with reference to gene inhibition in embryonic grafts between organisms bearing antagonistic genes, to the role of Mendelian analysis in plant improvement and to the problems connected with multiple factors, lethals and interspecific sterility. In emphasizing the great possibilities of recent work on intergeneric hybridization, Naudin's pioneer work (1861) on interspecific hybrids is mentioned. The importance is made clear of cytology in the study of sterility and fertility depending on polyploidy and in the problems of the origin of crop plants and the identification of natural hybrids such as those among the grasses. The possible chemical basis of incompatibility is also mentioned.

71. NACHTSHEIM, H.,
 SCHICK, R. and
 FREIHERR VON VERSCHUER, O. 575.17:001.4
 Die Bezeichnung der Gene. Vorschläge für eine internationale genetische Nomenklatur. (The designation of genes. Proposals for an international genetic nomenclature).
 Z. indukt. Abstamm.-u. VererbLehre 1937 : 73 : 55-62.

The article gives the recommendations of the German Commission on genetical symbols and nomenclature established in accordance with a resolution passed by the sixth International Congress of Genetics at Ithaca, 1932.

The establishment of a standard or normal type for each organism studied and the use of the system used in *Drosophila* work are recommended. Characters should be given Greek or Latin names, abbreviations of one to four letters being used for symbols. Multiple allelomorphs should be distinguished by subscript letters and polymeric genes by numerical indices. Polymeric genes are defined as genes having similar and additive effects; genes having superficially similar effects, such as the numerous albinos occurring in *Antirrhinum*, should be distinguished by different names. Genetical formulae for polyploids should be written out in full,

e.g., thus, $AAAAa$, not A^3a . Homologous genes in related species should have the same name and may be distinguished by an index consisting of an abbreviation of the species name. The female parent in a cross should always be given first and it is helpful to add the sex signs. The first published symbol should have priority, if in accordance with the rules.

72. TIKHONOV, P. M. 575.183
(Xenia in genetic investigations and in practical breeding).
 Izvestija Kazanskogo Sel'skokhozjaistvennogo Instituta, Kazan 1935 :
 30-41.

Attention is drawn to a number of cases where xenia can be of value in accelerating breeding or in selecting for quality.

73. ROELOFS, E. T. 575.22
 633.75:581.46:575.11
Phenotypical and genotypical eversporting varieties.
 Genetica 1937 : 19 : 465-536.

The literature on eversporting varieties is surveyed and the distinction between phenotypical and genotypical eversporting varieties is drawn. In the genotypical type the two forms have different genotypes as well as phenotypes, while in the phenotypical type the two forms have the same genotype. The phenotypically eversporting variety differs from the normal genotypically and may be said to be due to a gene or genes with less than 100 per cent penetrance, which is the percentage of individuals shewing the characters in question.

The author studied the case of *Papaver somniferum polycephalum*, which produces secondary pistils in the flower. The number of these varies in different flowers and different individuals, and the variety may therefore be considered eversporting. The differences in polycephaly, both within and between individuals were shewn to be due mainly to differences in nutrition, the better the nutrition the higher the degree of polycephaly. By replanting individuals at certain stages of their development it was possible to modify the expressivity of the character, i.e. the degree of polycephaly. The sensitive period during which this was possible consisted of two parts, replanting in the first of which caused an increase in polycephaly and in the second a decrease. The sensitive period ended with the beginning of the morphological development of the secondary pistils. Since the different flowers on an individual do not develop at the same time their sensitive periods did not coincide. The number of stigmata and the thickness of the peduncle, as indications of the vigour of individual flowers, and the thickness of the base of the main stem as an indicator of the vigour of the plant, shewed in general positive correlations with the degree of polycephaly, but in these replanting experiments they could be modified independently of polycephaly.

Genetically, polycephaly was found to be determined by two polymeric genes p_1 and p_2 . Full penetrance and high expressivity of polycephaly, under favourable environmental conditions, are produced by the genotype $p_1p_1p_2p_2$. Normal strains are $P_1P_1P_2P_2$. A strain with low penetrance and low expressivity isolated by selection has probably the genotype $P_1P_1p_2p_2$ or $p_1p_1P_2P_2$. The gene w for wax on the capsule also affects polycephaly and in the presence of ww the penetrance and expressivity of polycephaly are lower than in the presence of WW .

The character Va' (abnormal wing veins) in *Drosophila melanogaster* was also investigated and here again it was found that penetrance was modified by environmental conditions, the more favourable the environment the higher the penetrance.

74. MARTIN, C. P. 575.31
Contributions to the study of evolution : I. Temporary heredity and the mechanism of adaptation.
 Amer. Nat. (Suppl.) 1937 : 71 : 281-336.

A survey of the experiments and observations on the inheritance of acquired characters leads the author to suggest that the ability to respond to a stimulus, acquired or improved in one generation, may be inherited in subsequent generations. Acquired characters as such are not inherited.

The attunement to a stimulus is not inherited permanently, as are Mendelian characters, but tends to fade out if the stimulus is not repeated in each generation. It is possible that in the course of time a character that originally arose in response to a definite stimulus in the environment of the individual will, owing to the continued action of the same stimulus, arise earlier and earlier in each succeeding generation, until finally it can be evoked by some internal stimulus that for many generations has coincided with the influence of the external one. The character would thus become permanently inherited.

EVOLUTION 576.12

75.

VISSER SMITS, D. de

576.12

Wankelt de evolutie-leer? (**Has evolutionary theory been shaken ?**)

575.1:633

Bergcultures 1936 : 10 : 1034-39.

The history and development of evolutionary theory as reflected in the works of Lamarck, De Vries, Darwin, Roux, Lotsy, Johannsen, Nilsson and Plate are summarized, and the practical significance of Mendelism in modern plant breeding is made clear.

76.

ANDERSON, E.

576.16

Supra-specific variation in nature and in classification from the viewpoint of botany.

Amer. Nat. 1937 : 71 : 223-35.

This paper is one of a symposium in which the problem of the evolution of higher taxonomic units than species was discussed from the zoological, botanical and palaeontological points of view.

The author points out that amphidiploidy complicates phylogenetic relationships in the higher plants and goes on to discuss the effect of the radically different growth processes in animals and plants on the morphological relationships of taxonomic units in the two divisions of the living kingdom. In plants the phenomenon of repetition of similar parts is as common as it is in animals, but is of much less importance in classification. The principle of anisomerism or change of emphasis, on the other hand, is quite as important phylogenetically in the plant world as in the animal. The author suggests that the study of plant development is likely to be of importance in connexion with the problem under discussion.

CYTOLOGY 576.3

77.

SAX, K.

576.356:581.036.1

Effect of variations in temperature on nuclear and cell division in *Tradescantia*.

Amer. J. Bot. 1937 : 24 : 218-25.

Plants of *T. paludosa* were transferred from a greenhouse at 18° C. to a cold chamber at 8° C., to a hot chamber at 38° C., and from the cold chamber to the hot. The first two treatments produced some irregularities in microsporogenesis, but abnormalities were most consistently produced when plants were transferred from the cold to the hot chamber.

A week after the heat treatment, one day of which was as effective as longer exposures, segmental interchange rings at first metaphase of meiosis and inversion bridges at anaphase were to be observed in the pollen mother cells. Fused chromatids and fragments and also complex associations of non-homologous chromosomes were found at meiosis immediately after heat-treatment.

Other, more general abnormalities occurring as a result of heat treatment were various degrees of asynapsis with suppression of one of the divisions of meiosis, leading to dyad formation; amitotic division of the generative nucleus of the pollen grain; nuclear division without cell division and cell division without nuclear division.

The similarity of the cytological abnormalities produced by heat, narcotics, osmotic pressure, mechanical injury, regeneration of tissue, insect attack, disease, X-rays, ultra-violet light, genetic factors and ageing of seeds is pointed out and it is suggested that in general such agencies act by producing disturbances in the synchronization of nuclear and cytoplasmic activities.

78. BLARINGHEM, L. 58:007(44)
 II. Julien Costantin (1857–1936). Biologiste. [II. Julien Costantin
 (1857–1936). Biologist].
 Ann. Sci. Nat. (10^e Sér. Botanique) 1937 : 19 : XIII–XXIX.

An appreciation of the life and work of Julien Costantin, preceded by a list of his publications.

FIELD TESTS 631.421

79. PRZYBOROWSKI, J. and 631.421:519.24
 WILEŃSKI, H.
 Zastosowanie korelacji w niektórych przypadkach opracowywania wyników
 doświadczeń polowych. (On the use of correlation in some cases of
 practice of field experiments).
 Roczn. Nauk Rol. 1937 : 38 : 205–08.

A note supplementing a previous paper (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 932) in which certain measurable characters in field experimental plots, e.g. number of plants in sugar beet, were examined for their relationship to final yield, so as to deduce a method for reducing the experimental error by taking account of the regression of yield on the other measurement. Previously the assumption was made that the regression does not depend upon the treatments. In the present case the theory of a method which does not depend upon any such assumption is given. J. W.

PLANT DISEASES 632

80. RODENHISER, H. A. 632.451:575.11:575.127.2
 632.451:576.16
 Echinulation of chlamydospores and the pathogenicity of a pre-
 viously undescribed physiologic race of *Sphacelotheca cruenta*.
 Phytopathology 1937 : 27 : 643–45. (Abst.)

The chlamydospores of *S. cruenta* (Kühn) Potter have rather fine echinulations which are absent in *S. sorghi* (Link.) Clint. When hybrids of these two species (Cf. "Plant Breeding Abstracts", Vol V, Abst. 939) were back-crossed to *S. sorghi* 48 progenies were echinulate and 37 smooth.

Chlamydospores of *S. cruenta* collected from plants of Johnson grass near Sacaton, Arizona, had more prominent echinulations than any of those previously observed and from infection experiments with cultivated sorghums it is believed that this collection represents a new physiological form.

81. WESTERN, J. H. 632.451.2:577.8:576.16
 Sexual fusion in *Ustilago avenae* under natural conditions.
 Phytopathology 1937 : 27 : 547–53.

Studies on the infection of artificially inoculated oat grains and young flowers indicated that the parasitic dikaryophase is established through fusion of adjacent promycelial segments, presumably of opposite sex, by means of a fusion tube that ultimately gives rise to the true "infection hypha". The opportunities for hybridization are therefore restricted and if this type of behaviour predominates in nature it may explain the relative constancy of many physiological races.

82. STRAIB, W. 632.452 *Puccinia glumarum*:576.16:633.11
 Auftreten und Verbreitung biologischer Rassen des Gelbrostes. (The
 occurrence and distribution of biological races of yellow rust).
 Forsch. Fortschr. dtsch. Wiss. 1936 : 12 : 149–50.

Yellow rust, *Puccinia glumarum* (Schm.) Erikss. et Henn., is the most-feared rust of west and central Europe. The knowledge of the existence of biological races of yellow rust is fairly recent, but 33 different races are now known of which 18 are present in Germany. Mutation is chiefly responsible for the occurrence of new races.

The races can be grouped in a definite order according to their virulence and infection behaviour. In genetical work with wheat, the progeny of crosses need only be tested with 5 races (1, 2, 6, 26 and 27), in work with barley only with race 24. Yellow rust attacks various cereals and wild grasses with varying virulence and no form is limited to one particular cereal. With regard to distribution, the cultivation of only one variety is regarded as a dangerous policy as it increases the spread of a particular race. Races are known to disappear when there is a lack of the appropriate host variety.

83. MCKINNEY, H. H. 632.8:575.17:576.16
Virus mutation and the gene concept.
 J. Hered. 1937 : 28 : 51-57.

A survey of the work of the author and others on this problem mainly in common mosaic of tobacco. Mutant forms arise differing in their ability to disturb the plastid pigment mechanism, in their capacity for invading different species and also in their effects at different temperatures. In other respects, such as the upper thermal inactivation point, ability to retain a comparatively high activity in dry tissue and in plant extracts and in their antigenic properties, they shew little change.

It is considered that there is no evidence to shew that the different strains represent different enzymes. The primary virus and its mutants probably represent a series of closely related compounds which function essentially as genes.

84. RAZDORSKAJA, L. A.,
 GORJAINOVA, N. S. and
 GORJAINOV, A. A. 632.951.1:575(47)
(Insecticidal *Pyrethrum* forms—cultivation, harvest and utilization).
 Institut Lekarstvennykh Rastenii (VILAR) 1936 : Pt. 5 : Pp. 104.

Chapter I of this composite monograph deals briefly with the various forms of *Pyrethrum*, the history of the plant, its cultivation in various countries and future prospects. Chapter II is devoted to a botanical description of *Pyrethrum cinerarifolium* Trev., the localization of its active principle, the districts where it is grown, its ecological and biological features, methods and possible regions of cultivation, yields, the handling of the raw product and prospects of developing breeding work. Most of the material put upon the market in various countries (1936) is obtained from highly heterogeneous populations and hence varies greatly in its insecticidal properties. Practical selection of the Dalmatian form of *Pyrethrum* is being begun in the U.S.S.R. and a study of the biology of flowering and pollination have shewn that this form is protandrous and cross-pollinated, no set being obtained when bagging is employed, though artificial pollination within the limits of the individual plant has proved to some extent successful and it is believed that the set could be increased by improving the technique. The *Pyrethrum* content of the Dalmatian form has also been studied and by selection and hybridization it is hoped that high-yielding, immune and hardy varieties suitable for mechanical harvesting and for export may be obtained.

Chapter III deals with the Caucasian forms (*P. carneum* M.B. and *P. roseum* M.B.), their distribution, botanical description, preparation and cultivation. Chapters IV-VII (inclusive) are concerned with discoveries of new insecticidal plants, pyrethrin, its chemical composition and determination, methods of investigating the toxicity of *Pyrethrum* preparations and the use of pyrethrin in agriculture.

Chapter VIII deals with agronomic problems relating to *P. cinerarifolium* in the U.S.S.R., including methods of raising seedlings, and with breeding experiments begun in 1933 with Dalmatian *Pyrethrum*, as well as material from other sources. The original population with which the work was begun in 1933 shewed considerable fluctuation in its biological, morphological and chemical characters, some of which may, however, be heritable. Selection for a suitable type should therefore give good results. Individual selection under conditions of free pollination and inbreeding, which was already begun, is to be developed by drawing on the world collection of *Pyrethrum* types, by extending selection and by using more rapid breeding methods. Some plants that flowered 5-10 days earlier than the rest are to be observed for economic characters such as yield and toxicity. Data have also been collected

on the marked variation in individually selected plants as regards weight of the inflorescence and pyrethrin content. Further studies of elite plants of the Dalmatian *Pyrethrum* and their progeny are expected to lead to the production of a variety of high yield and toxicity. The rest of the monograph deals with problems of disease and mechanization. An extensive classified bibliography is appended.

85. CULBERTSON, R. E. 632.951.1:575.42:581.192.6
Pyrethrin I content of strains of *Pyrethrum cinerariaefolium*.
 Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 590-91.

Open-pollinated selections were made in 1931 and 1932, on the basis of toxicity, time of bloom, yield, upright stems and other characters, in plants grown from Swiss seed. The primary object has been the isolation of strains rich in pyrethrin I and the analyses of the selections here presented shew that the pyrethrin I content of the selected strains ranges from 0.58 to 1.02 per cent, as compared with 0.30 to 0.50 for flowers imported from Japan and Dalmatia.

ECONOMIC PLANTS 633

86. DUCOMET, V. 633:575.7
Dégénérescence des plantes cultivées. (The degeneration of cultivated plants).
 Sélectionneur 1936 : 5 : 161-87.

The phenomena of degeneration are discussed, under the heads pathological, physiological and genetical degeneration.

The various forms that degeneration takes and the measures used to control it are briefly considered. The cause of degeneration in many cases still remains obscure.

87. DERŽAVIN, A. 633:581.143.26:575.127
(Breeding perennial wheats and other crops).
 Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1937 : No. 1 : 164-69.

Hybrids produced by crossing wheat with perennial rye were sterile but by back-crossing large numbers of them a certain number of grains were produced, 165 from 189,000 flowers pollinated. A few of the plants obtained from these grains were fertile and from one highly fertile perennial plant a large progeny was obtained. This progeny proved to be highly resistant to drought and stem rust and also resistant to brown rust. The ears were superior to Ukrainka in size, containing up to 70 grains each and two yields of grain were obtained from some of the plants in 1936.

Perennial hybrids have also been obtained from annual x perennial rye, sunflower (*Helianthus tuberosus* x *H. rigidus*) back-crossed to *H. tuberosus*, vetch (crossed with *Vicia crassa*), pea (*Lathyrus latifolius*) and sorghum.

88. COONS, G. H. 633-2-1.521.6:575
Progress in plant pathology : control of disease by resistant varieties.
 Phytopathology 1937 : 27 : 622-32.

In this brief review the author endeavours to assess in dollars the value of disease-resistant varieties of crop plants and mentions some of the problems and methods of breeding, such as straightforward selection, hybridization with wild species, variability of the pathogen, escape as opposed to true resistance and the nature of disease resistance.

89. HUMPHREY, H. B. 633-2-1.521.6:575
The development of disease-resistant plants.
 Rep. 3rd Int. Congr. Comp. Path., Athens 1936 : 1 : Pt. 2 : 267-74.

Early control measures and those of the present day have indicated the desirability of breeding for the development of disease-resistant plants. This method of disease control is now of major importance and has resulted in improvements in many crop plants.

Resistant strains in crops must possess other desirable qualities such as large yields, superior quality, and satisfactory agronomic characters to guarantee adoption and popularity with the growers.

In the case of wheat the problems of breeding lines resistant to stem rust, and at the same time resistant to leaf rust, to bunt, to loose smut, and to foot rot are involved, as well as the question of the ever-growing number of physiologic forms of the rust fungi. This problem has also been met with in breeding varieties of flax resistant to rust.

The special problems involved in breeding pure lines of maize for crossing are discussed.

It is emphasized that in this method of disease control, co-operation between the plant breeder and the pathologist is essential. The problem is difficult but not impossible when subjected to the combined forces of agronomy and pathology. F. M. R.

90. POLITIS, J. 633-2-1.521.6:575
 Immunité et hérédité chez les végétaux. (**Immunity and heredity in plants**).
 Rep. 3rd Int. Congr. Comp. Path., Athens 1936 : 1 : Pt. 2 : 83-95.

The first part of this paper deals with the role of certain chemical substances in the protection of the plant against parasitism.

In the second part of the paper the author discusses the glucosides, tannins, and anthocyanin pigments formed in plant tissues, and in the last two sections vacuoles and their relation to hereditary factors and the nuclear origin of the vacuole are discussed. F. M. R.

91. BUTLER, E. J. 633-2.4-1.521.6:575
 The nature of immunity from disease in plants.
 Rep. 3rd Int. Congr. Comp. Path., Athens 1936 : 1 : Pt. 2 : 1-15.

True hereditary resistance may follow simple Mendelian laws or may be due to the interaction of a complex of several factors. Even inherited resistance can be influenced by environmental conditions which serve merely to heighten or lower relative inherent resistance. Complete immunity is less susceptible to environmental modifications. Improvement in environmental conditions often results in heightened resistance, but the question whether anything can be done to immunize a plant which is perfectly adjusted to its environment remains to be answered. The most positive evidence in favour of acquired immunity is found in observations and studies of symbiosis between fungi or bacteria and the higher plants. His examination of the problem of immunity in plants confirms the author in his view that analogies between animal and plant diseases must be sought mainly in intracellular pathology. Little evidence exists that anti-parasitic action in plants spreads beyond a few cells around those originally attacked. F. M. R.

CEREALS 633.1

92. KNYAGINICHEV, M. I. 633.1:581.192:575.22:576.16
 (Intergeneric and interspecific regularities in the variation of the protein content in the ears of cereals).
 Bull. Appl. Bot. Leningrad 1936 : Ser. III (15) : 55-65.

The correlation found between size of grain in the spikelet and the absolute and percentage protein content (Cf. Abst. 116) is again demonstrated and the existence of a similar correlation in rye confirmed. In barley species, however, the absolute protein content within an ear or a row in the ear proved constant regardless of the weight of the grain and is therefore a generic character.

In determining the protein content full allowance must be made for variation arising from environmental influences and from heterogeneity in pure line varieties as regards characters pertaining to their chemical composition; for these two types of variation, though both hereditary, are fundamentally different, the one depending on the hereditary capacity for the degree of response to a given environment and the other depending on the genotypically determined properties of the plant organism.

93. SCHWANITZ, F. and
SCHWARZE, P. 633.1-1.557:581.1:575.1
Die physiologischen Grundlagen für die Züchtung von ertrag- und eiweissreichen Sorten bei unseren Getreidearten. (**The physiological basis for the breeding of cereal varieties with high-yield and a high protein content**).

Forschungsdienst 1937 : 4 : 19-31.

SCHWANITZ, F. and

SCHWARZE, P.

Die genetischen Grundlagen für die Züchtung von ertrag- und eiweissreichen Sorten bei unseren Getreidearten. (**The genetical basis for the breeding of cereal varieties with high yield and a high protein content**).

Forschungsdienst 1937 : 4 : 60-81.

The work on the effect of climate and soil fertility and other environmental conditions affecting protein content and yield as well as the course of uptake of food material in cereals is reviewed in the first part of this paper, and the conclusions to be drawn from the results when breeding work is being undertaken are briefly summarized. In the second part of the paper the genetics of yield and protein content are reviewed, and the practical considerations arising therefrom are summarized.

A bibliography of 287 titles completes the articles.

94. STAKMAN, E. C. and
HART, H. 633.1-2.452-1.521.6
The nature of resistance of cereals to rust.

Rep. 3rd Int. Congr. Comp. Path., Athens 1936 : 1 : Pt. 2 : 253-66.

The facts and generalizations discussed in this paper are chosen mainly from experience and experiments with *Puccinia graminis tritici* though many of them apply, in varying degrees, to all rusts. There are at least three clearly defined types of resistance in wheat to this rust and others which either are not clearly defined or are imperfectly understood.

Protoplasmic resistance, at one time considered the sole type of resistance, is first discussed. This type of resistance is determined by genetic factors in both the wheat plant and the physiologic race of rust involved, and by the effects of environment on the interaction between them. It cannot be depended upon in large land areas where many physiological forms exist and where new ones are likely to be produced or introduced. The likelihood that a variety would be severely injured, however, is reduced if it is resistant to many races.

Observations have shewn that morphological characters may account for increase in resistance in some varieties. Kota wheat, for example, is susceptible to certain physiological forms in the seedling stage in the greenhouse but is often fairly resistant in the field. In this and in certain other varieties it is thought that the number, size, and shape of the collenchyma bundles in the stem might account for the general field resistance.

In addition to this type of resistance, some of the durum wheats such as Webster and Kota have a very tough epidermis. These wheats obviously have a certain degree of protection against all physiological races owing to the limitation of the area in which the rust can grow and the consequent limitation in size of the pustules.

The degree of morphological resistance naturally varies somewhat with environmental conditions. In the case of so-called breakdown of resistance of morphologically resistant varieties a number of factors must combine to bring about a heavy rust attack. For practical purposes there is a distinct advantage in using varieties with this type of resistance either as parental material for breeding work or as commercial varieties for general use. F. M. R.

95. SCHAD, C.,
DESAYMARD, P.,
MAYER, R. and 633.1.00.14:575(44)
HUGUES. 634.1:581.162.3(44)
Recherche et expérimentation en 1934-1935 dans le Massif Central.
(**Research and experiments in 1934-1935 in the Massif Central**).

Sélectionneur 1936 : 5 : 149-60.

The apple, "Canada blanc", requires the presence of good pollinators such as Calville blanc, Calville rouge or Jonathan.

The high-yielding variety of rye "Grand Crouelle" bred by the Station should replace the local varieties for cultivation in the mountainous districts. Petkus and Wierzbinski are recommended for their resistance to lodging.

The barley variety Probsdorf has good possibilities for cultivation in the centre and south of France. As regards wheat, the lines from the cross K 8 x Czeckacz are of good quality and resistant to cold and are recommended for the mountainous parts of the Massif Central.

The oat variety, Grise de Craponne, is very susceptible to lodging but has a high quality grain and is resistant to smut. "Montferrandaise" from the cross von Lochow x 176,7 combines the qualities of the local oats with high yield and resistance to lodging.

WHEAT 633.11

96. 633.11:575(44)
633.11 Côte d'Or
CRÉPIN, C.

Le blé Côte d'Or. (**The wheat Côte d'Or**).

Agric. Prat. Pays Chauds 1937 : 101 : 1035-37.

The variety, Côte d'Or, is an early, high-yielding wheat, resistant to cold, lodging and to yellow and black rust and of good baking quality. It was selected from a cross between V.P. 15-5 and the variety Mouton à épi rouge.

97. 633.11:575(48.5)
633.11 Fylgia, élite c
ÅKERMAN, Å.

Svalöfs Fylgiavårvete. Elit c. (**Svalöf's spring wheat Fylgia Élite c**).

Sverig. Utsädesfören. Tidskr. 1937 : 47 : 9-11.

The new line of Fylgia, élite c, is a selection from élite b, which it surpasses in yield.

98. 633.11:575(48.5)
633.11 Sol IV
ÅKERMAN, Å.

Svalöfs Solvete IV. (01121) En ny sort av Solvetetyp. [**Svalöf's Sol wheat IV. (01121) A new variety of the Sol wheat type**].

Sverig. Utsädesfören. Tidskr. 1937 : 47 : 201-03.

The new strain of Sol wheat was raised from a cross between Kron wheat x Sol II. It is higher yielding than either parent, has a good standing capacity and should replace Sol III.

99. 633.11:575.113.7
633.11:575"793"
KOSTYUCHENKO, I. A.

(**The premature perishing of the hybrids in wheat crosses**).

Bull. Appl. Bot. Leningrad 1936 : Ser. A (19) : 127-37.

The phenomenon described consists of the drying up of the plant from the time of appearance of the third leaf or somewhat later. Frequently a whole F_1 may be affected or in later generations certain plants die off, shewing that the character is a segregating one. The degree of non-viability of such seedlings was different in different crosses and in the different regions in which the hybrids were grown, being most pronounced under the arctic conditions of Khibiny. F_2 populations examined at Khibiny gave proportions of non-viable to viable approaching the ratio 9:7, indicating that two main complementary factors are responsible for the phenomenon. These factors are called Ll and Tt and crosses in different combinations shew that Novinka has the formula $LLtt$, Yeoman II $llTT$. Prelude and certain other varieties, however, gave a non-viable F_1 with both these varieties, shewing that more than the two factors exist and suggesting that each may be represented by a series $L_1, L_2 \dots L_n$ and $T_1, T_2 \dots T_n$.

In almost all the crosses between spring and winter wheats the F_1 was later in earing than the earlier of the two parents. This may be due to their pathological conditions and the results shew that good healthy plants may segregate from these F_1 plants; selection in the F_1 as proposed by Lysenko would thus have been ill-advised.

100. SHEN, L.-Y. 633.11:575.12
(**Methods employed in the hybridization of Chinese wheat**).
Spec. Publ. Nat. Agric. Res. Bur. Nanking 1937 : No. 19 : Pp. 31.
The breeding of new varieties of wheat by hybridization is described. Details are given of the pedigree or line breeding method, the back-cross method and the bulk method. It is pointed out that the bulk method requires less labour than the other two, but the chance of success is less.
101. HÉBRARD, J. 633.11:575.12(44)
Résultats complémentaires des essais d'hybridation de blés effectués à l'École Nationale d'Agriculture de Montpellier de 1931 à 1936. (**Further results of hybridization experiments, with wheat made at the École Nationale d'Agriculture de Montpellier from 1931-1936**).
Ann. Éc. Agric. Montpellier 1937 : 24 : (N.S.) : 258-65.
Four strains of wheat, representing the final product of the series of experiments already reviewed (Cf. "Plant Breeding Abstracts", Vol. III, Abst. 377) are here described.
102. MIÈGE, E. 633.11:575.127.2
Sur le mode d'apparition de diverses espèces dans la descendance de deux hybrides interspécifiques de *Triticum*. (**On the way in which various species have appeared among the progeny of two interspecific hybrids of *Triticum***).
Extrait du Livre Jubilaire dédié au Professeur Lucien Daniel 1936 : Pp. 4.
The progeny of several generations of the crosses *T. dicoccum* Sch. var. *farrum* Bayle x *T. polonicum* var. *abessinicum* Kcke and of *T. dicoccum* Sch. var. *farrum* Bayle x *T. durum* Desf. var. *Valenciae* Kcke are briefly noted as among them have appeared forms resembling *T. Spelta* and *T. vulgare* besides the parental forms. A cytological investigation has yet to be made.
103. TANAKA, M. 633.11:575.127.2
[**Some notes on crossing experiments in wheat with *Timopheevi*-pollen. (A preliminary note).**]
Jap. J. Genet. 1937 : 13 : 68-70.
Several 42-chromosome wheats, including *T. persicum*, *T. Spelta*, *T. vulgare* and *T. compactum* were used as seed parents in crosses with *T. Timopheevi*. The set obtained varied from 0 in one of the *T. Spelta* strains used to 93 per cent in one of the *T. compactum* strains. Plants derived from a pentaploid hybrid, having chromosome numbers ranging from 28 to 42 were also pollinated with *Timopheevi* pollen. The maximum set was obtained on the 28-chromosome plants. The set decreased as the chromosome number increased to 35, where a minimum was reached. The next maximum was at 39 and the set then diminished again as the chromosome number increased to 42.
104. MATSUMURA, S. 633.11:575.127.2:576.312.35:581.162.5
Weitere Untersuchungen über die pentaploiden *Triticum*-Bastarde VII. Beziehung zwischen Chromosomenzahlen und Fruchtbarkeit in den Rückkreuzungen des Bastards *T. polonicum* x *T. Spelta* zu den Eltern. (**Further investigations on pentaploid *Triticum* hybrids VII. Relation between chromosome number and fertility in the back-crosses of the hybrid *T. polonicum* x *T. Spelta* to the parents**).
Jap. J. Bot. 1936 : 8 : 205-14.
The fertility of back-cross individuals from the crosses F_1 x *T. polonicum* and reciprocal gave a negative correlation with chromosome number, which ranged from 28 to 35. The progeny of the other two back-crosses, *T. Spelta* x F_1 and reciprocal, shewed the opposite relation, fertility being positively correlated with chromosome number, which ranged from 35 to 42. This agrees with the results in the descending (chromosome numbers 28 to 34) and ascending (36 to 42) groups in the F_2 .

Fertility was higher in the *T. Spelta* back-cross progenies and the plants with 42 chromosomes were as fertile as the spelt parent. Grouping the plants in the different back-crosses by chromosome number it was found that plants with 33 chromosomes had the least fertility; the 34-chromosome plants were clearly more fertile, though they in turn were less fertile than those with 35. Plants with 28 chromosomes were less fertile than the *T. polonicum* parent.

105. MATSUMURA, S. 633.11:575.127.2:576.312.35:581.331.2
 Weitere Untersuchungen über die pentaploiden *Triticum*-Bastarde VI. Häufigkeit der verschiedenchromosomigen Pollenkörner bei dem Bastard *T. polonicum* x *T. Spelta*. (**Further investigations on pentaploid *Triticum* hybrids VI. Frequency of pollen grains with different chromosome numbers in the hybrid *T. polonicum* x *T. Spelta***).
 Jap. J. Bot. 1936 : 8 : 189-204.

The frequencies with which pollen grains with chromosome numbers from 14 to 21 occurred in the pentaploid hybrid between *T. polonicum* var. *vestitum* Körn. and *T. Spelta* var. *Duhamelianum* Körn. were investigated by counting the chromosomes at the first pollen grain mitosis and were found to agree fairly well with those expected from the expansion of the binomial $(0.6 + 0.4)^7$, indicating that a moderate amount of univalent elimination occurs. The relative frequencies agreed also with those earlier established (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 503) for the embryo sacs.

Certation crosses were made in 1934 and 1935 by pollinating *T. Spelta* and *T. polonicum* parents with F_1 pollen and the chromosome numbers of the resulting individuals were determined. In both crosses made in 1934 the results were very similar; the pollen grains with intermediate chromosome numbers functioned less often than the euploid grains and of the latter, the 21-chromosome functioned more frequently than the 14-chromosome grains. When a correction was applied to allow for the greater proportion of failures in the *T. polonicum* x F_1 cross, the proportion of 21 to 14-chromosome grains functioning was about 3:1 in both crosses. The percentage of successes in the crosses made in 1935 was less, 55.5 per cent for *T. Spelta* x F_1 as compared with 93.8 in 1934 and 28.2 per cent for *T. polonicum* x F_1 as against 56.4 per cent. The *T. Spelta* x F_1 results agreed with those from the preceding year's material and when a correction was applied as before, the proportion of 21 to 14-chromosome grain participating in fertilization was again 3:1. The *T. polonicum* results, however, were quite different and here even after the correction was applied there were about equal numbers of functioning 14 and 21-chromosome grains. This increase in the proportion of 14-chromosome grains is attributed to a selective influence on the part of the 14-chromosome embryo sacs, becoming important when competition in the stigma is decreased.

The corrections mentioned were based on the success of interspecific crosses made at the same time as the back-crosses concerned.

Among the aneuploid grains those with 20 chromosomes effected fertilization more often than the euploid grains with 14, but those with 15-19 functioned quite rarely.

The frequencies of chromosome numbers from 28 to 42 in the F_2 progeny were found to agree well with those predicted on the basis of the above observations.

106. YAMASHITA, K. 633.11:575.127.2:576.356.4
 [Karyogenetic studies on pentaploid wheat hybrids: some trisomic progenies with 29 chromosomes. (Preliminary communication)].
 Jap. J. Genet. 1937 : 13 : 15-17.

By back-crossing the pentaploid F_1 hybrid *Triticum polonicum* x *T. Spelta* to *T. polonicum*, plants with 29 chromosomes were obtained, carrying different members of the D genom in addition to the genoms AABB. These plants, which the author calls trisomics, give rise to 28, 29 and 30 chromosome plants in their progeny. The lines carrying different chromosomes in excess were arbitrarily termed d_1 , d_2 , d_3 , etc.

In the d_1 pedigree it was found that genes causing red colour in the young plant were present in the A and B genoms as well as in the extra chromosome. Leaves of d_2 plants were narrow and somewhat curled. Trivalent formation was observed in d_1 and d_2 plants. Genes affecting

the length of the awns and the attitude of the tillers were located on chromosome d_3 , while chromosome d_4 carried factors for keeled glumes and hollow stems. The author considers that the factors for absence or presence of awns are in the A genom and those for length of awn in the B and D genomes. Hollowness of stem, found in *T. Spelta*, is determined by genes in the B and D genomes, hollow stem being the recessive allelomorph in the B genom and the dominant in the D genom.

107. MATSUMURA, S. 633.11:575.127.2:576.356.5:576.356.4
(On the plants with unexpected chromosome numbers in back-crosses of pentaploid wheat hybrids).
 Jap. J. Genet. 1937 : 13 : p. 47.

Among the back-cross progeny from the hybrid *T. polonicum* ($2n = 28$) x *T. Spelta* ($2n = 42$), using *T. polonicum* as seed parent and the F_1 as pollen parent there occurred two plants out of 149, Nos. 28 and 85, with 36 somatic chromosomes. It is assumed that the male gametes concerned must have had 22 chromosomes, owing to non-disjunction in the hybrid.

In No. 85 there were found $15_{II} + 6_I$ in 92 per cent of the pollen mother cells while in No. 28 there were $14_{II} + 8_I$ in 68 per cent and $1_{III} + 13_{II} + 7_I$ in 32 per cent of the cells. No. 85 was more vigorous and fertile than No. 28 and its progeny were also more viable, though the seeds of No. 28 germinated better.

In the progeny, chromosome numbers from 29 to 42 were observed and three plants had fragment chromosomes ($31 + f$, $33 + f$ and $37 + f$).

In the back-cross using *T. Spelta* as seed parent one plant out of 210 had $2n = 44$. Meiosis was not studied in this plant. Its progeny had 42, 43 and 44 chromosomes.

108. VAKAR, B. A. 633.11:575.127.5:633.14:576.354.4
(Cytological investigations of constant wheat-rye hybrids).
 Trans. Omsk Inst. Agric. 1935 : 1 : Nos. 1-6 : 59-104.

This is the full original version of the article reviewed in "Plant Breeding Abstracts," Vol. V, Abst. 662.

109. KATTERMANN, G. 633.11:575.127.5:633.14:576.356.4
 Chromosomenuntersuchungen bei halmbehaarten Stämmen aus Weizenroggenbastardierung. **(Chromosome investigations on strains with pubescent stems from wheat-rye hybridization).**
 Z. indukt. Abstamm.-u. VererbLehre 1937 : 73 : 1-48.

Meiosis was studied in the pollen mother cells of some 110 F_4 and F_5 plants from wheat x rye crosses, the strains concerned carrying the rye character, pubescent stem, but otherwise resembling wheat (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 830 and Vol. VII, Abst. 592). The results indicate that this character is located in a rye chromosome which is carried in excess of the wheat complement by plants with pubescent stems. The chromosome in question can be identified at meiosis by a deep, median constriction, whether it is in the univalent or the bivalent condition, and it was also possible to identify it at the first metaphase of meiosis in rye.

Two degrees of pubescence were distinguished, plants with slight pubescence carrying the supernumerary chromosome in the univalent condition and those with strong pubescence in the bivalent condition. Smooth-stemmed plants lack this chromosome altogether. Exceptions to the rule were noted but they are not unexpected, in view of the fact that smooth-stemmed plants occur in most varieties of rye; bad fixation or difficulties of observation account for other apparent exceptions.

It was found that gametes carrying the "pubescence" chromosome functioned less frequently than those without it, when in competition with the latter, especially on the male side and it is possible also that a certain amount of zygotic elimination is caused by this chromosome. Bearing this in mind and also the fact that when unpaired the "pubescence" chromosome was apt to be lost at anaphase, the breeding results agree with the cytological findings. Smooth-stemmed plants bred true, slightly pubescent individuals gave a small proportion

of plants like themselves on selfing and strongly pubescent plants bred true or nearly so; occasional failure of pairing of the pubescent chromosomes even when two of them were present accounted for the failure of strongly pubescent plants to breed absolutely true. The results of back-crosses with wheat pollen also shewed good agreement with the cytological findings. It was unnecessary to assume that pubescent stem ever behaved as a recessive character (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 315).

Numerous cytological irregularities were recorded. All plants shewed a tendency to multi-valent formation and to failure of pairing of several chromosomes, including the "pubescence" chromosome. Extra chromosomes were present in many cases, apart from the "pubescence" chromosome, and it is proposed to attempt to identify the different members of the rye genom as they appear in such plants and study their genetic effects. Fragment chromosomes were present in some strains, sometimes remaining unpaired and sometimes giving rise to heteromorphic bivalents. The "pubescence" chromosome was represented by a fragment in some plants. Speltoid and compactoid forms were noted with characteristic cytological irregularities.

110. VAKAR, B. A. 633.11:575.127.5:633.289:576.356
(Wheat-Agropyrum hybrids).

Trans. Omsk Inst. Agric. 1935 : 1 : Nos. 1-6 : 11-58.

The substance of this paper is the same as that reviewed in "Plant Breeding Abstracts", Vol. VI, Abst. 833.

111. SHIBAEV, P. N. 633.11:575.127.5:633.289:664.641.016
Grain quality of couch grass and wheat-couch grass hybrids.

Cereal Chem. 1937 : 14 : 437-39.

The substance of this paper is contained in the Russian article reviewed in "Plant Breeding Abstracts", Vol. VII, Abst. 597.

112. SCHKWARNIKOW, P. K. 633.11:575.24:581.01
Über Erhöhung der Mutationsrate bei Weizen nach langer Aufbewahrung der Samen. (On the increase of the mutation rate in wheat after long storage of the seed).

Genetica 1937 : 19 : 188-99.

The substance of this paper has already been reviewed (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 163).

113. UCHIKAWA, I. 633.11:575.242:576.356.4
[Cytogenetic studies on compactoid wheat. (A preliminary note)].
Jap. J. Genet. 1937 : 13 : 9-15.

The author found the following chromosome numbers in certain abnormal derivatives of 42-chromosome wheat: short normal 41, heterotype speltoid 41, semi-compactum 43 and short compactum 44. In the semi-compactums most pollen mother cells had $21_{II} + 1_I$ though $20_{II} + 1_{III}$, $20_{II} + 3_I$ and $19_{II} + 1_{IV} + 1_I$ were also observed.

The pollen mother cells of the short compactums had usually 22_{II} , while $21_{II} + 2_I$, $20_{II} + 1_{IV}$ and $20_{II} + 1_{III} + 1_I$ were also found. In the short normal type $20_{II} + 1_I$ was mostly found. Data are given on the configurations found at first metaphase of meiosis in progenies of the different types.

The author proposes the following formulae for the different types: normal (42) $\frac{ABC}{ABC}$; short

normal (41) $\frac{ABC}{BC}$; semi-compactum (43) $\frac{ABCC}{ABC}$; short compactum (44) $\frac{ABCC}{ABCC}$ heterotype

speltoid (41) $\frac{ABC}{AB}$. The compactoid types are therefore caused by duplication of the C chromosome.

114. SIMONET, M. and FLECKINGER, J. 633.11:576.356.52
 Sur la présence de deux plantes haploïdes chez *Triticum spelta* L. (**On the presence of two haploid plants in *T. Spelta* L.**).
 Ann. Épiphyt. Phytogénét. 1937 : 3 : (N.S.) : Fasc. 1 : 23-34.

Two haploid plants which occurred in a strain of *T. Spelta* L. var. *albospicatum* Flaks. are described.

115. KARIŠNEV, R. V. 633.11:581.142:575
 (The causes of unequal germination of wheat seed within a pure line).

Bull. Appl. Bot. Leningrad 1936 : Ser. A (20) : 133-39.

Large grains took longer to germinate than small ones though the percentage germination for both groups was about the same after 70 hours, the longest period tested.

Such differences are attributed not to genetic causes but to physico-chemical and anatomical characteristics of the structure of the endosperm and the outer coats of grains of different size.

116. KNYAGINICHEV, M. I. 633.11:581.192:575.22:576.16
 (Variation of the protein content in single grains of diverse wheat varieties).

Bull. Appl. Bot. Leningrad 1936 : Ser. III (15) : 5-30.

As a contribution to research on factors contributing to high yield, a study was made from the morphological standpoint of the protein content in thirteen varieties of wheat representing six species. In addition to determinations of the nitrogen content of individual seeds within the spikelet and the ear, similar determinations were made of the variation in nitrogen content in individual ears in a single plant and also in individual plants within a variety. Further, the effects of manures upon the range of variation and the differences in the nitrogen content in the mealy endosperm (with the aleurone layer removed) in grains of different sizes were studied from the standpoints of the spikelet and of the ear.

The results shewed *inter alia*:—

The different range of variation of the protein content of individual seeds within the limits of different spikelets, ears and plants was genotypically conditioned.

The middle spikelets, as compared with the upper and lower ones, produce larger grains containing on the average a greater percentage of protein. In all varieties with two grains or more per spikelet it was found that, within the limits of the spikelet, the greater the weight of a grain, the higher was its protein content both absolutely and relatively. This correlation was found within the limits of the ear in *Triticum monococcum*, whereas *T. dicoccum* presents an exception in that it held only for the absolute values.

The relation between nitrogen content and grain size would therefore appear to be a generic character exhibiting interspecific variation.

The range of variation in the protein content was considerably less within the individual ears than among the single grains of an ear.

The relations that may exist between sequence and duration of flowering on the one hand and protein content on the other are also discussed.

117. LEGGIERI, L. 633.11:581.48:575
 Sul valore agrario ed ereditario dei semi di grano stremenziti. (**On the agricultural value and the inheritance of shrivelled wheat grains**).
 Ann. Tec. Agr., Roma 1937 : 10 : 157-74.

The experiments shewed that normal plants with normal, plump grains, were obtained from sowings of shrivelled grains and the condition is not inherited.

118. GUDKOV, A. N. 633.11:581.481:575
 (The phenomenon of embryolessness in wheat seeds and its causes).
 Bull. Appl. Bot. Leningrad 1937 : Ser. IV (2) : 139-67.

Data are given on the incidence and frequency of occurrence of the above mentioned phenomenon in various cereals including wheat and especially rye. The failure of the embryo to develop is regarded as a varietal characteristic. It was more frequently found in hybrid varieties than in others and is apparently favoured by the conditions in northerly latitudes. Though investigations on the possibility of a genetic basis existing for this character have been inconclusive the data on hybrid wheat varieties and their parent forms suggest that it may be genetic.

Various factors contributing to the condition are mentioned, including distant hybridization and an open type of flower, in addition to the primary cause, namely single fertilization in which the endosperm develops but not the embryo.

119. LAMB, C. A. 633.11-1.557:581.46
 The relation of awns to the productivity of Ohio wheats.
 J. Amer. Soc. Agron. 1937 : 29 : 339-48.

Owing to the unpopularity of bearded wheats in Ohio it would be of advantage to breed only beardless forms, provided that awned wheats are not better yielders than awnless ones. To investigate this question data were gathered from bulked hybrid progenies, F_3 to F_5 , segregating for awns. The measurements taken were length of straw, length of head, grains per head and 1,000-corn weight, single heads being taken as units. The results indicate that though the awned heads had probably a slight advantage in yield, it was too small to be of practical importance. There seems to be no reason therefore for carrying bearded selections in the breeding nursery.

The correlations between the different characters were calculated. Positive correlations between length of straw and head and grains per head were found in all years, but the correlations involving 1,000-corn weight varied from year to year.

120. TALALAEV, E. V. 633.11-2.111-1.521.6:575:578.081
 (On a method of breeding winter wheat for frost resistance).
 Bull. Appl. Bot. Leningrad 1936 : Ser. A (20) : 43-49.

Early and late sowings were made of two winter wheats, Zenka, which is not frost-resistant, and Lutescens, which is, and also of 32 winter wheats from various countries, the latter forms comprising two groups, namely vernalized and unvernallized plants. In determining the frost resistance the plants were dug up in January with the roots, bound together in lots of 25-50, and placed in paper containers filled with soil and then transferred to the cold frame for freezing. There they remained till the 26th of February when they were put to grow in the greenhouse for a month. The number of plants of each variety totalled about 75-150 for all the repetitions carried out. It is claimed that by this method of dealing with groups of plants, larger numbers can be tested and the accuracy of results increased, and also that injury to the plants is avoided, while at the same time the space occupied by the test material is relatively small.

The results shewed that frost resistance in winter wheats increases with the lateness of the sowing regardless of their ecological or geographical origin. Early sowing and vernalization lowered the frost resistance. The physiological basis of these phenomena needs more detailed investigation.

By early sowing or partial vernalization it should be possible to select out frost-resistant forms from natural and hybrid populations and by the use of both procedures combined the process of selecting resistant varieties in the breeding plots should be hastened.

The significance of these findings in regard to the possible need for a revaluation of wheats of the world collection as breeding material and in regard to the varieties undergoing official trials is evident in view of the influence of late sowing on frost resistance.

121. MEDVEDEV, G. M. 633.11-2.112-1.521.6:578.081
(Estimating the drought resistance of crop plants in breeding).
 Bull. Appl. Bot. Leningrad 1936 : Ser. A (20) : 89-97.

Accepting the view that the drought resistance can be measured by the intensity of the assimilatory activity of a plant, the author devoted most of this paper to a full discussion of a modification of Sachs's half-leaf method, adapted for use with cereals in determining the relative increase in dry weight of duplicate portions of leaf, one of which has been subjected to darkness for a certain period.

It is claimed that by the use of the technique evolved, satisfactory agreement was obtained with both winter and spring wheats between the indexes found for intensity of assimilation and the actual drought resistance.

122. WIEBE, G. A. and BRIGGS, F. N. 633.11-2.451.2-1.521.6:575
The degree of bunt resistance necessary in a commercial wheat.
 Phytopathology 1937 : 27 : 313-14. (Abst.).

In crosses between a variety completely resistant to bunt (*Tilletia tritici*) and a susceptible one, some of the resistant segregates are not completely resistant, the resistance of the one parent having been reduced by modifying factors carried by the other. The question arises whether such lines, which are particularly likely to occur if the back-cross method is used, are suitable for commercial production.

Two slightly bunt susceptible lines, one from the cross Martin (resistant) x White Federation, back-crossed to the latter twice and one from the cross Martin x Sonora, back-crossed to the latter three times, were inoculated and grown in 1934, giving 0.8 and 5.6 per cent respectively of bunted ears. The seed was planted again in 1935 without further inoculation and seed from this crop again in 1936. In the 1936 crop no trace of bunt could be found, though the control varieties, White Federation and Sonora, treated in the same way, maintained high percentages of bunted ears in all three years.

It is concluded that slightly susceptible lines are suitable for commercial production even under conditions very favourable for bunt.

123. *JAKUBTSINER, M. M. and MUROMTSEV, E. P. 633.11-2.451.3
(Immunity of wheat species to flag smut).
 Bull. Appl. Bot. Leningrad 1936 : Ser. A (20) : 69-87.

The work of previous authors on *Urocystis tritici* is reviewed. Tests made by the author and his associates have shown the 42-chromosome group to be almost immune; e.g. *T. compactum*, *T. Spelta*, *T. macha*, *T. Vavilovi* and *T. sphaerococcum* were entirely free from infection; and of 1,031 samples of *T. vulgare* tested only 14 were attacked. On the other hand most of the 28-chromosome group were infected, including *T. persicum* and *T. Timopheevi*, though this latter species was only attacked very slightly. *T. monococcum* was immune. Many soft wheats known to be susceptible in China and Australia remained free from infection in Russia, while some varieties of *T. durum* resistant in America were attacked. The Russian biotype would therefore appear to be distinct.

The results are taken as supporting Vavilov's theory of the association between immunity and systematic position, indicating at the same time that immunity is a complex problem. The immunity of most of the 42-chromosome wheats and susceptibility of the 28-chromosome group has been confirmed by inoculation experiments. Certain immune forms have nevertheless been found among the latter group, e.g. in *T. durum horanicum* Vav. and others, and it is thought that selection for resistance among the agronomically most valuable varieties might be profitable.

* An extended summary of this paper is on file at the Bureau.

124. MCFADDEN, E. S. 633.11:2.452-1.521.6:575.127.2
False "black chaff" of wheat produced by inoculating with stem rust.

Phytopathology 1937 : 27 : p. 801. (Abst.).

The so-called "black-chaff" disease of the wheats Hope and H-44 has been shewn to be at least partly the result of a peculiar reaction to infection by *Puccinia graminis tritici*. The discoloration is probably the result of disintegration of the rust organism.

In the F_2 of a cross H-44 x Marquis all plants giving the "black-chaff" reaction were resistant to stem rust in the mature plant stage and it is suggested that the "black-chaff" reaction can be used in some crosses as an indicator of one type of mature plant resistance, to enable resistant plants to be identified before the blooming stage. This may simplify breeding for rust resistance, especially by the back-cross method.

125. THOENES, H. 633.11:664.641.016:575
Qualitätszüchtung und Qualitätsbewertung bei Weizen. (The breeding and valuation of quality in wheat).
Die Zuckerrübe in der Erzeugungsschlacht. Gebrüder Dippe A.G. Quedlinburg : 35-40.

A brief review of the subject of baking quality from the point of view of the miller, the baker and the breeder.

126. MÉNERET, G. 633.11:664.641.016:575.11
Observations sur l'hérédité du caractère "qualité" du blé. (Observations on the heredity of the character "quality" of wheat).
C.R. Acad. Agric. Fr. 1937 : 23 : 742-47.

All the determinations were made by the Pelschenke method. The hybrids studied were from the cross between Providence ♂, a wheat of good baking quality and Ferrette ♀ of poor or medium quality. In the F_2 the baking quality of most of the plants either resembled that of the weak parent or was intermediate; only a few inherited the good quality of the male parent. Of these, some shewed transgression. Quality therefore behaves as a recessive character and at least two factors are assumed to be concerned in its inheritance.

127. MARKLEY, M. C. 633.11:664.641.016:575.11.061.6
Variability in carotenoid pigment content of individual plants of *Triticum vulgare* and *Triticum durum*.
Cereal Chem. 1937 : 14 : 400-09.

The carotinoid pigment content of ground wheat meal of individual plants of two hard red spring wheat varieties, H-44 and Minnesota No. 2,303, was studied. It was found that when the carotinoid pigment content was expressed as parts per million of the ground wheat meal there was great variability and that content was negatively correlated with grain weight. When carotinoid pigment content was calculated as weight of pigment per grain it was positively correlated with grain weight. By applying a correction based on the regression of pigment content on weight of grain the variability in carotinoid pigments per grain was reduced nearly to the experimental error.

Rust resistant strains of amber *durum* had been produced at the Minnesota Station from crosses between the highly pigmented, leaf rust-susceptible Mindum and the low pigmented, rust resistant Pentad. The macaroni made from these strains, however, had not the deep clear yellow colour of the parent Mindum and crosses were therefore made to see whether it would be possible to transfer the pigmentation of the latter into a hybrid strain.

Multiple factor inheritance of carotinoid pigments was found in the F_2 and in this generation highly pigmented plants were found, shewing that it was possible to transfer the character.

128. IKEDA, T. 633.11:664.641.016:578.081(52)
(Studies on the baking quality and flour texture of Japanese wheat with special reference to the experimental technique applied to the selection of wheat strains).

J. Imp. Agric. Exp. Sta. Nisigahara 1937 : 3 : 129-50.

The results of baking tests with native Japanese varieties, new varieties from crosses between Japanese and foreign wheats, imported grain (Manitoba Northern etc.) and commercial flours are presented. The native Japanese varieties were found to be poor in baking quality. Some of the new Japanese varieties were quite good but not as good as Manitoba wheats. A microscopic examination of flour shewed that some samples, which are hard in texture, contain particles of angular form and vitreous appearance—called “vitriform” particles—as well as the ordinary starch granules. Flours with little or no vitriform particles are soft in texture. It is suggested that the presence of these particles in the flour made from a few grains would be a useful measure of quality in breeding work.

The correlation between baking quality and gluten content was much better when only flours of hard texture were considered than when all classes of flours were included.

It was found that the swelling property of gluten does not appear to be a varietal character, but is largely affected by environmental conditions.

129. KIHARA, H. 633.11*Aegilops*:575.127.2:576.354.4:576.356.5
[Morphology, fertility and chromosomes of back-cross hybrids (*Aegilops caudata* x *cylindrica*) ♀ x *caudata* ♂. (A preliminary note)].

Jap. J. Genet. 1937 : 13 : 61-62.

At the first meiotic division in pollen mother cells of F_1 hybrids of *Ae. caudata* ($n = 7$) x *Ae. cylindrica* $7_{II} + 7_I$ are usually to be observed, shewing that these two species have one genom in common. *Ae. cylindrica* has the genom formula CCDD and *Ae. caudata* must therefore be CC or DD. The reduction division of F_1 hybrids of *Ae. caudata* x *Triticum vulgare* (AABBDD) shew that *Ae. caudata* has no D genom.

The F_1 hybrid shewed a fertility of 9 per cent when pollinated with *Ae. caudata* pollen and 4 per cent with *Ae. cylindrica* pollen. The back-cross hybrids all had 14 chromosomes. Most of the genes of the D genom appear to be dominant.

OATS 633.13

130. NISHIYAMA, I. 633.13:575.127.2:581.48:575.11
[On the inheritance of certain grain characters in oats. (A preliminary note).]

Jap. J. Genet. 1937 : 13 : 63-65.

A report on the inheritance of grain characters in the cross between *A. sativa* and *A. fatua*. The author differs from previous workers (Cf. “Plant Breeding Abstracts”, Vol. III, Abst. 560) in respect to the inheritance of hairs on the back of the first grain and maintains that in addition to the factor closely linked with *B* (black grain) there is a factor on the C chromosome affecting this character. Evidence in support of this contention was obtained by crossing a monosomic plant of *A. sativa* with *A. fatua*. The monosomic plant lacked one C chromosome and is given the formula $40 + C_s$. When crossed with *A. fatua* the 41-chromosome plants in the F_1 and F_2 must have $40 + C_t$ chromosomes. C_s and C_t represent the *sativa* and *fatua* C chromosomes respectively. An F_3 was raised from 41-chromosome plants with non-black grains, so as to exclude the factor linked with *B*, and with hairs on the first or second grains; it contained plants with 40 , $40 + C_t$ and $40 + 2 C_t$. Those with $40 + C_t$ and $40 + 2 C_t$ had hairs on the first and second grains, their grains being almost identical with those of *A. fatua*.

131. SOUKHOV, K. S. 633.13:576.312.3
(The structure of resting nuclei in embryonic tissues of *A. sativa* in anabiosis).

Biologičeskij Žurnal (Biologischeskij Zhurnal) 1937 : 6 : 111–16.

Sections made from dry grains of *A. sativa* stored from the previous year's harvest were used in this experiment to demonstrate the continuity of the chromosomes. Detailed observations are recorded on the nuclear structures observed in the embryonic tissue and on the disposition of the chromosomes and the chromatin in the cell and their reaction to staining. (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 789).

132. RAINIO, A. J. 633.13-2.42-1.521.6
 Kauralaatujen punahome- *Fusarium roseum* Link.—*Gibberella Saubinetii* (Mont.) Sacc. kestävyydestä. [**On the resistance to *F. roseum* Link.—*G. Saubinetii* (Mont.) Sacc. of certain oat varieties**].

Valt. Maatalousk. Julk. 1937 : No. 92 : Pp. 24.

The effect was studied of certain morphological characters and of the length of the vegetative period on resistance of oat varieties to *Gibberella Saubinetii*. The naked oats are all very susceptible but among the oats with hulls the proportion of hull did not appear to have much effect on the resistance to the fungus.

Thickness of the glumes appeared also to be of secondary importance in determining resistance. The varieties with closed glumes were the most resistant and those with open glumes were, in general, more susceptible than those with partly closed glumes. There was a definite relation between the time of ripening and resistance. The later the ripening, the more susceptible the variety. Resistance then depends mainly on a suitable combination as regards the methods of closing of the glumes and earliness.

RYE 633.14

133. MÜNTZING, A. 633.14:576.356.52:581.036.5
Note on a haploid rye plant.
 Hereditas, Lund 1937 : 23 : 401–04.

Spikes of *Secale cereale* were exposed to a temperature of -3°C for 30 minutes, 20 hours after pollination. All the 46 seeds obtained gave rise to seedlings, 44 of which were quite normal. The other two were very feeble, with light green leaves. Only one of them survived the winter and the chromosome number in its root tips was found to be 7. Judging from the phenotypical similarity the other weakly plant was probably also haploid. The surviving haploid died without flowering, reaching a height of about 5 cms.

The author suggests that the weakness of this rye haploid is due to the presence of unfavourable genes such as cause weakness on inbreeding.

MAIZE 633.15

134. HOROVITZ, S. and SANGUINETI, M. E. 633.15:575.11:581.481
***Siamensis*, nuevo caracter hereditario del maiz. (*Siamensis*, a new hereditary character in maize).**
 Rev. Argent. Agron. B. Aires 1936 : 3 : 245–49.

The character, consisting in the production of twin plants from the same grain, which remain united in the fashion of Siamese twins, has been observed in two local Argentine varieties of maize. It is recessive to the normal and F_1 hybrids between the two different types observed were possessed of the character, shewing them to be therefore identical or allelomorphic. There is variation in the time at which the duplication first arises, so that all degrees between two separate plants and no duplication at all may be found. The two plants apparently arise always from the same ovule.

135. MEIJERS, P. G. 633.15:575.12:575.183
Op welken afstand is de kruisbestuiving tusschen twee maisrassen nog merkbaar? (**At what distance is cross-pollination between two varieties of maize still discernible?**).
Landbouwk. Tijdschr. Wageningen 1937 : 49 : 237-41.

Observations with the early blue seeded Japanese variety of maize Sanjunichi grown near a larger plot of the yellow seeded Dutch variety N.H.M. which ripens fairly early shewed that cross-pollination of the yellow by the blue variety had occurred frequently within a range of from 1-10 metres. At a distance of between 10 and 15 metres however, instances of xenia were reduced and beyond that distance occurred only very rarely, the number of blue grains being only 1 in 4,000.

Among the factors affecting the chances of cross-pollination were time of flowering and position of the cob on the stem, those cobs situated higher up on the stem being apparently more liable to cross-fertilization than those lower down.

136. LONGLEY, A. E. 633.15 *Euchlaena*:576.312.34:576.354.4
633.15:575.127.5
Morphological characters of teosinte chromosomes.
J. Agric. Res. 1937 : 54 : 835-62.

Detailed descriptions are given of the morphology of teosinte chromosomes at pachytene, with special reference to their length, the position of the centromere (spindle fibre attachment) and of deeply staining knobs.

The chromosomes of Florida teosinte (*Euchlaena mexicana* Schrad., $n = 10$) suggested a close relationship between this form and teosintes collected at El Progreso and Moyuta in southern Guatemala, supporting the historical record that teosinte was introduced into Florida from southern Guatemala by way of France.

In F_1 hybrids of Florida teosinte and maize the pairing at pachytene varied in different plants. Observations in the plants shewing almost regular pairing revealed slight differences between the homologues from the two forms in respect of length and the position of the centromere, the differences being most marked in chromosomes V and IX. Differences were also noted in respect of the position of the knobs, which only coincided in two instances.

Other forms of *E. mexicana* studied were from Northern Guatemala and from Durango and Chapingo in Mexico. The northern Guatemalan teosintes differed from the southern forms in having more frequent diminutive terminal knobs and in possessing intercalary knobs on certain chromosomes. The Mexican annual types were characterized by many intercalary knobs and fewer terminal knobs than in the Guatemalan types. In addition, all forms have an intercalary knob at the point where chromosome VI is attached to the nucleolus. Apart from this, intercalary knobs are regarded as indicating contamination with maize.

Three tetraploid types were also studied, *E. perennis* from Mexico, a tetraploid perennial reputed to have been derived as a mutation from annual teosinte and tetraploid pollen mother cells found in a plant of Durango teosinte. The first two types were very similar and shewed only diminutive terminal knobs while the tetraploid Durango cells shewed the characteristic knobs of the diploid type. Both perennial forms had the intercalary knob on chromosome VI. The knobs in *E. mexicana* and maize were found to be relatively constant in position.

All the 18 chromosomes of *Tripsacum floridanum* Porter were found to have terminal knobs and the chromosome attached to the nucleolus had also an intercalary knob.

No knobs were found on sorghum chromosomes. The longest chromosome was attached to the nucleolus near the centromere. Discussing the nature of the knobs found in the *May-deae*, the author suggests that they are enlarged chromomeres and points out that in their tendency to stick together they resemble the B or inert chromosomes such as he observed for instance in a plant of Durango teosinte. In teosinte the knobs can also be seen at the prophase of the second division.

137. POWERS, L. and
DAHL, A. O. 633.15:576.354.4:576.356:575
**Failure of diakinesis and metaphase pairing and the behavior during
meiosis of univalent chromosomes in *Zea mays*.**
J. Agric. Res. 1937 : 54 : 655-68.

The frequency of univalent formation in plants of inbred lines of maize was studied at diakinesis and first metaphase and it was found that while most plants produced some univalents, there were significant differences between plants in the number of univalents produced. There was also a tendency for more univalents to be found at metaphase than at diakinesis. The univalents in these plants often lagged and divided at the first division, a process which resulted in chromatin loss at the second division. It was found that there was an association between failure of pairing at the first division and chromatin loss at the second and it would therefore be expected that plants that shew much failure of pairing would be less fertile than the others. This was not the case, however, and it is suggested that failure of pairing is affected by environmental conditions and that the cells studied cytologically had not been subject to the same environmental conditions as those which produced the grain.

A different type of univalent behaviour was observed when a line carrying two supernumerary chromosomes was crossed with a 20-chromosome line. In the F₁, which had 21 chromosomes, the odd univalent regularly went to one pole or the other at the first division, preceding the other chromosomes, and behaved normally at the second division. In the early prophase stages it resembled a B (inert) chromosome. It was found, however, that it was transmitted relatively more frequently through the ovules than through the pollen, which indicates that it carries some genetically active material. In plants carrying three of these extra chromosomes trivalent formation was observed.

The importance of studies of meiotic instability in relation to breeding work is discussed.

138. SNEDECOR, G. W. and
COX, G. M. 633.15-1.557:581.145.1:519.24
Analysis of covariance of yield and time to first silks in maize.
J. Agric. Res. 1937 : 54 : 449-59.

Data concerning yield and the time elapsing after 30th June to the first appearance of silks in 14 varieties of maize are used to determine the relation between yield and time to silking. The method is that of the analysis of covariance, and the principal concern of the paper is to describe in detail the statistical technique appropriate to this method of analysis. J. W.

139. POOLE, C. F. 633.15-2.7-1.521.6
635.67-2.7-1.521.6
**Resistance to corn earworm injury in the Charleston South Carolina
area.**
Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 566-69.

Tuxpan and Davis Prolific are shewn to be resistant varieties and also able to transmit resistance to hybrids. Other outstanding parents of resistant hybrids were Papago, Mexican June and Oregon Evergreen.

140. HOROVITZ, S. 633.15-2.7-1.521.6:575.11
Resistencia del maiz "Amargo" al ataque por la langosta. (**Resistance of
"Amargo" maize to corn borer attack**).
Rev. Argent. Agron. B. Aires 1937 : 4 : 27-38.

A real difference, statistically significant, was observed between the Amargo races of maize and the common races in their susceptibility to attack by the corn borer. There were also, however, differences in degree of resistance of the different Amargo races, suggesting the existence of one genetic factor for Amargo and other modifying factors influencing resistance.

141. PATCH, L. H. 633.15-2.7-1.521.6:575.12
Resistance of a single-cross hybrid strain of field corn to European corn borer.
 J. Econ. Ent. 1937 : 30 : 271-78.

The survival of larvae of the European corn borer, *Pyrausta nubilalis* Hbn., on the single crosses Ill. A x Ind. Tr (susceptible to corn borer) and Ill. R4 x Ill. Hy (resistant) was measured under conditions of natural infection. The numbers of egg masses laid on the two hybrid strains was about the same, but the number of borers reaching maturity on R4 x Hy was only 46.6 per cent of the number on A x Tr. Small differences noted between the strains in leaf area and maturity would not account for this difference. The susceptible hybrid has about the same resistance as the local open-pollinated varieties.

R4 x Hy is a high yielding hybrid.

142. KIESELBACH, T. A. 633.15.00.14:575.12
How corn varieties and hybrids yielded the past season.
 Ann. Rep. Neb. St. Bd. Agric. 1936 : 248-53.

Data are given on the performance of maize hybrids in Nebraska, with the pedigrees of those hybrids which have been produced by experiment stations.

BARLEY 633.16

143. PROSKOWETZ, E. 633.16:575(43.72)
 Memorabilien. (**Memorabilia**). 633.16 Hanna
 Edited by the Czechoslovak Acad. Agric., Prague 1937 : No. 7 : Pp. 43.

An account of the history and cultivation of barley in Moravia with special reference to the breeding of Hanna barley.

144. ROBERTSON, D. W. 633.16:575.116.1.061.6
Inheritance in barley II.
 Genetics 1937 : 22 : 443-51.

The linkage of the following chlorophyll deficiencies with factor pairs in each of the seven linkage groups was tested: $A_{c2}-a_{c2}$, green versus white seedlings, occurring in the strain Coast II; A_n-a_n , green versus white seedlings, occurring in *Hordeum distichum nigrinudum* I; X_s-x_s , green versus yellow seedlings, occurring in Smyrna I.

$A_{c2}-a_{c2}$ was found to be linked with $N-n$ (covered versus naked caryopsis) in Group III and independent of factor pairs in five of the other linkage groups. The cross-over percentage was 27.24 ± 2.04 .

The factor pairs A_n-a_n and X_s-x_s were found to belong to Group VI, containing A_c-a_c (green versus white seedlings) and X_c-x_c (green versus *xantha* seedlings). The order and linkage of the genes in this group is given as: $a_c - 4 - x_c - 9.37 - a_n - 15.49 - x_s$. The linkages determined were X_s-x_s linked with A_c-a_c with 25.74 ± 1.73 per cent crossing-over, A_n-a_n linked with X_c-x_c with 9.37 ± 0.65 per cent crossing-over and X_s-x_s linked with A_n-a_n with 15.49 ± 0.86 per cent crossing-over. A_c-a_c and X_c-x_c were already known to be linked with less than 4 per cent crossing-over.

A_n-a_n and X_s-x_s were shewn to be inherited independently of factor pairs in the other linkage groups.

145. NILOVA, V. P. 633.16:575.243:537.531:577.15
(The action of Roentgen rays on ferments in barley seeds and sprouts).

Bull. Appl. Bot. Leningrad 1936 : Ser. III (14) : 109-15.

Euler's results (Cf. "Plant Breeding Abstracts", Vol. II, Abst. 187) are confirmed. Irradiation of barley seeds with 12,000 r, resulted in the highest number of chlorophyll mutants and the lowest catalase activity. The amylase activity of sprouts from irradiated seeds is considerably lowered though it is only very slightly affected in the dry seed.

In both dry seeds and the sprouts raised from them, the maximum activity of the proteolytic enzymes present is produced by that X-ray dosage which evokes the greatest number of mutations.

146. POPE, M. N. 633.16:581.162.3:581.331
The time factor in pollen-tube growth and fertilization in barley.
 J. Agric. Res. 1937 : 54 : 525-29.

In the variety Hannchen (*Hordeum distichon palmella*), it was found that the male gametes had entered the embryo sac within 45 minutes of pollination and reached or entered the egg nucleus and one of the polar nuclei. The first division of the fertilized egg was completed within 15 hours after pollination.

147. HARLAN, H. V., MARTINI, M. L. and STEVENS, H. 633.16:581.46:575
Inferior yields obtained from crosses of six-rowed x two-rowed barleys.
 Science 1937 : 86 : 35-36.

Evidence is briefly presented from an experiment in which all possible crosses between 28 varieties of barley were made, to shew that the yield of selections from six-rowed x two-rowed barleys is less than that from six-rowed x six-rowed. A small proportion of the selections from the former type of cross was worth continuing.

148. NILSSON-EHLE, H. 633.16:663.421:575(48.5)
 633.16 Opal B
Några ord om Sveriges Utsädesförenings malkornsförädling. (Notes on the Swedish Seed Unions improvement of malting barley).
 Sverig. Utsädesfören. Tidskr. 1937 : 47 : 7-8.

Opal B, which in comparison with the old Opal barley has a rather higher yield and still stiffer straw, has a higher starch percentage than Kenia, and a lower protein content.

Other new and promising strains are being tested, particularly progeny from the crosses Seger x Binder and Seger x Opal.

MILLETS AND SORGHUMS 633.17

149. PCHELINTZEVA, I. I. 633.171:575.061.5
(A new form of strongly pubescent millet).
 Bull. Appl. Bot. Leningrad 1936 : Ser. A. (19) : 141-142.

The pronounced pubescence of the vegetative organs characteristic of the new form, and thought to be of value in arid districts, is constant in inheritance.

150. ELLIOTT, C., MELCHERS, L. E., LEFEBVRE, C. L. and WAGNER, F. A. 633.174-2.411.2-1.521.6:575.11
Pythium root rot of milo.
 J. Agric. Res. 1937 : 54 : 797-834.

Inter alia, the reaction of several sorghum varieties to the disease, caused by *Pythium arrhenomanes* is given. Milos, certain milo crosses and darso are very susceptible, kafirs, sorgos, feteritas and some other sorghums are resistant.

Resistant varieties are the only feasible method of control and resistant strains have been isolated from Dwarf Yellow milo, Beaver, Day milo and Wheatland. Susceptibility has been found to be due to a single, partially dominant factor S in crosses of Dwarf Yellow milo (susceptible) x Club (resistant).

151. YAMAGUCHI, Y. 633.18:575.113.6.061.6
(A preliminary note on the inhibitory factor for leaf coloration in the rice plant).

Jap. J. Genet. 1937 : 13 : 56-58.

Evidence is presented to show that in addition to the genes *S*, *B* and *Pl* concerned in leaf coloration there is an inhibiting factor *H* which in the homozygous or heterozygous condition causes light colour, *hh* plants only being dark.

152. HIRAYOSHI, I. 633.18:575.127.2:576.354.4
 633.18:576.356.5

[Species hybrids between cultivated rice and wild rice (*Oryza latifolia*) with special reference to their sterility and maturation division. (A preliminary note).]

Jap. J. Genet. 1937 : 13 : 59-60.

The cross between *O. sativa* and *O. latifolia* was made using both *japonica* and *indica* strains of the former. Earing was good in the *indica* F_1 hybrids but not in the *japonica* hybrids. The anthers did not dehisce and so far no seed has been set by pollination with pollen of either parent.

O. sativa has $n = 12$ chromosomes and *O. latifolia* $n = 24$. Little or no pairing was observed at meiosis in the F_1 and the course of meiosis was often very irregular. It is concluded that neither of the two *O. latifolia* genomes is homologous with the genome of *O. sativa*.

153. CHEVALIER, A. 633.18:576.16
 Sur les riz africains du groupe *Oryza glaberrima*. **(On the African rices of the group *O. glaberrima*).**

Rev. Bot. Appl. 1937 : 17 : 413-18.

An account of the history and distribution of *Oryza glaberrima* in Africa and a critical review of the classification of *O. glaberrima* proposed by Viguier and Camus. (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1267).

154. PIACCO, R. 633.18-1.524.2(45)
The problem of seed in rice cultivation and the acclimatisation of foreign varieties in Italy.

Int. Rev. Agric. 1937 : 28 : T105-17.

Rice varieties cultivated in Italy degenerate in cultivation and have to be replaced by new varieties, making necessary a continual search for new types. The three possible methods are selection, hybridization and acclimatization. Varieties have been obtained by the first two methods, but the present article is concerned with acclimatization.

The lack of success of the numerous introductions in the nineteenth century is attributed to the haphazard manner in which the work was done. In 1932 the Rice Experiment Station at Vercelli applied for samples of varieties from different parts of the British Empire and many other rice-growing countries. Over 200 varieties were grown and the results are briefly reported. Only two were found to be suitable for cultivation in Italy, a variety from San Domingo and the variety Peking, received from Japan. Many of the varieties had too long a vegetative cycle and some did not flower at all. The question of photoperiodic requirements is important in this respect, rice being a short-day plant. Others were discarded on account of unfavourable agricultural and technical characteristics.

In future work on this problem, Italian agriculturalists, familiar with the Italian requirements, should have a hand in the choice of material for introduction.

ROOTS AND TUBERS 633.4

155. KRASOCHKIN, V. T. 633.41:575(47)
(New facts in beet-root breeding).
 Bull. Appl. Bot. Leningrad 1936 : Ser. A (19) : 15-27.

Only 57 per cent of the inbred seeds gave viable seedlings. In addition to the removal of undesirable recessive genes which is possible by inbreeding, it has also been found possible to select forms possessed of desirable characters such as good and uniform root shape, flesh colour, disease resistance, and earliness in the first year.

A remarkably high degree of self-fertility has been found in the variety Green Top, one flowering branch of which has given 100-600 seeds when bagged, as compared with 300-500 in the open; as many as 30 per cent of the inbred seeds may, however, be non-viable, though the proportion of non-viable seeds is different in different lines and there is thus the possibility of selecting lines with high viability. A semi-sugar beet, Giant Sugar Rose, has also given fairly high percentages of selfed seeds.

Promising segregates have been obtained from a chance hybrid between sugar and table beet, one of the segregates having a high dry matter content approximating to that of sugar beet, combined with a larger root of a round form free from all branching or secondary roots.

Plants of wild *B. maritima* with 15 per cent sugar content and over have been observed among the northern forms and as it is improbable that the original selectionists had the best possible combinations of sugar genes at their disposal it seems likely that some of these wild forms may serve to raise the sugar content of the present sugar beets. They are also highly frost resistant, withstanding temperatures of -14°C . almost without damage. Their perennial habit and freedom from bolting also recommend them as breeding material, as well as their tolerance of saline soil, immunity to *Cercospora* and *Peronospora*, relative homozygosity (compared with the Mediterranean wild forms) and high self-sterility compared with the cultivated beets. In the attempt to produce a sugar beet with a rounded root, the many advantages of which are enumerated, crosses were made of sugar beet with a white Iranian round beet. Some of the F_3 segregates had sugar contents of 15-17 per cent as compared with 17.46 for the sugar-beet parent grown under same conditions. The hybrids had a high dry matter content and are regarded as promising for the production of round sugar beets, possibly after back-crossing with sugar or wild northern beets, and also for the production of a round, semi-sugar forage beet.

156. GESCHER, N. v. 633.491(8)
Improvement of varieties of potatoes by means of indigenous South-American varieties.
 Int. Rev. Agric. 1937 : 28 : T117-21.

This brief survey covers much the same ground as "The South American potatoes and their breeding value", published by this Bureau.

157. BUKASOV, S. M. 633.491:575(47)
(Principal achievements in potato breeding).
 Bull. Appl. Bot. Leningrad 1936 : Ser. A (19) : 83-85.

Certain new species have been added to the genus *Solanum* from foreign collections, the position of others changed (e.g. *S. polyadenium* transferred to the section *Tuberosa*). *S. Mil-lanii* and *S. Vavilovii* have proved to be not resistant to *Phytophthora* and the latter also not drought-resistant, as was supposed.

New and promising varieties have been obtained by inter-varietal crossing. Among the interspecific crosses, hybrids of *S. Rybinii* are promising in respect of early maturity and hybrids and back-crosses of *S. andigenum* have proved unexpectedly high in starch content and in yield.

For most regions it is desirable to have varieties combining frost resistance and blight resistance and this is best done by using *S. demissum* as a parent; some of the domestic x *demissum* hybrids and back-crosses appear promising, e.g. a hybrid Epicure x *demissum* x Katalidin. Promising blight-resistant lines have also been obtained by complex crossing.

158. TIKHONOV, P. M. and DEMIDOVICH, A. F. 633.491:575.11(47)
(The inheritance of farming characters and results of potato selection).
 Izvestija Kazanskogo Sel'skokhozjaistvennogo Instituta, Kazan 1935 : 96-117.

The frequency distribution of yield per plant is given for the F_1 hybrids of the following crosses: Imperator x Parnassia, Imperator x Granat, Granat x Fürstenkrone, Wohltmann x Fürstenkrone and Parnassia x Granat. In all cases the parental limits were transgressed, most of all in Imperator x Parnassia, where some hybrid plants produced as many as 1,200 and even 1,600 grm. of tubers. The frequency distributions all tended to be displaced towards the lower yields, which appear therefore to be dominant. Odd individuals with exceptionally high yields occurred, either as a result of gene combination or possibly mutation.

The F_2 was examined only in the cross Granat x Fürstenkrone, being obtained by selfing. Here the variation was wider than in F_1 and the curve of distribution was bimodal, confirming a suggestion of bimodality observed in the F_1 curves of this and the other F_1 's and indicating a close relationship between the two parental forms.

The F_1 distribution with regard to earliness indicated that this was a recessive character, the majority of hybrids being late, while in F_2 a number of early forms segregated. The earliest maturity was found mostly in the high-yielding forms, a correlation which is very favourable in the production of good early varieties.

Starch content was less complex in inheritance, giving in some cases an approximation to a monofactorial relationship in F_1 , and was not in any way linked with earliness or with yield. The size of the starch grains was greater in the early segregates, in which starch formation had evidently begun earlier; the starch grains in the segregates with the largest grains were usually less uniform in size, except in some of the earliest forms, where the best combination of size and uniformity is evidently to be sought.

The above results shew that successful combinations of characters will only be attained by using very large populations. The most promising of the crosses tried were Imperator x Parnassia and Wohltmann x Fürstenkrone and certain seedlings have already been obtained that combine high productivity, starch content, disease resistance, keeping capacity, earliness and good tuber shape.

159. BAYLISS, R. 633.491:581.162.51
(Cytological and embryological investigation of potatoes in connection with their sterility).
 J. Inst. Bot. Acad. Sci. Ukraine 1936 : No. 10 (18) : 99-143.

A number of abnormalities in meiosis and the later stages of microsporogenesis are described, leading to male sterility. Normal development was observed in the embryo sac in all cases except in the varieties Lotos and Woltmann-Zaikevitch, which require further investigation. It is considered that the basic cause of sterility in the potato is the irregularity of meiosis in the pollen mother cells, arising from chromosome unbalance. Meteorological or ecological conditions also have their effect, but only intensify or weaken the action of the internal factor.

160. ELLISON, W. 633.491:581.331.2:576.356.5
The occurrence of giant pollen mother cells in the cultivated potato (*Solanum tuberosum* L.).
 Genetica 1937 : 19 : 153-55.

Among 40 British varieties of potato studied, giant pollen mother cells were observed only in Arran Crest. Some of the giant cells had several nuclei, eleven being observed in one. Others had only one large nucleus, but that had very numerous chromosomes.

161. *PERLOVA, R. L. 633.491:581.48:576.16
(The morphology and systematic classification of seed of wild and cultivated species of the potato).
 Bull. Appl. Bot. Leningrad 1937 : Ser. IV (2) : 41-46.

The seeds of 14 cultivated and 21 wild species are described in detail and the relative dimensions and sizes are tabulated.

In general, the cultivated species differ from the wild in having large seeds and no depression on the periphery, the depression in the wild species being mostly sharply defined, always clearly visible when present and only rarely entirely absent.

162. ORECHOVA, T. A. 633.491:581.48:578.081
(Anatomical differences between seeds of different species and varieties of potatoes).
 Bull. Appl. Bot. Leningrad 1937 : Ser. IV. (2) : 47-50.

Using cultivated and wild species and varieties, a classification based on differences in the structure of the seed coat was evolved for use in laboratory identification.

163. Frost resisting South American potatoes. 633.491-2.111-1.521.6(8)
 Science 1937 : 85 : No. 2196 : (Suppl.) : p. 7.

The substance of the work briefly reported here is contained in the bulletin reviewed in "Plant Breeding Abstracts", Vol. IV, Abst. 1015.

164. RŽAVITIN, V. N. 633.491-2.111-1.521.6:578.081
(Testing potatoes for frost resistance by laboratory methods).
 Bull. Appl. Bot. Leningrad 1936 : Ser. A (20) : 107-14.

Two methods were used in this investigation: (1) freezing the plants in pots in a cold greenhouse or refrigerator and (2) the determination of the electrical conductivity of the aqueous extract obtained from plants injured by frost. The latter method was specially adapted from Dexter, Tottingham and Graber's method. The techniques used are fully described as well as a special freezing chamber constructed by the author which is declared to be both cheap and effective, while capable of providing a temperature of from -8 to -9° C. Different species, varieties and hybrids of potatoes both cultivated and wild were used. In the tests by the first method *S. demissum* and *S. ajanhuiri* proved the most resistant, shewing little injury at -4° C. and none at -3.5° C., though at -5.5° C. they all perished. Next in order of resistance was the group *S. semi-demissum*, *S. goniocalyx* x *S. Bukasovii*, shewing considerable damage at -3.5° C., followed by *S. curtilobum*, *S. andigenum* f. *taccla* and *S. tuberosum* Switez which displayed severe injury at the same temperature. The rest, which included *S. phureja*, *S. andigenum* f. *caiceda* and also some varieties of *S. tuberosum* died off completely at -3.5° C.

Outstanding in their resistance were the hybrids *S. demissum* x *S. semidemissum*, *S. demissum* x *S. andigenum* f. *Pacus*, *S. ajanhuiri* x (*S. goniocalyx* x *S. Bukasovii*), which stood -3.5° C. with very slight injury, a temperature which proved fatal to the hybrids from *S. andigenum* and *S. tuberosum* with *S. curtilobum* and from the cross between *S. andigenum* and *S. tuberosum*. The groupings obtained by determining the electrical conductivity in ten species and seventeen hybrids, in which the resistance of the extracts decreased as the injury caused by the cold increased, corresponded to those obtained by the first method. Not only were specific differences noted in the variation in the amount of resistance recorded, but also a decrease in the resistance was discernible in cases in which injury was not visible to the eye.

Data are also given shewing the results obtained with the freezing chambers, in which *S. acaule* displayed only slight damage at -8° C. Various forms of *S. demissum* differed in

* A slightly abridged translation of this paper is on file at the Bureau.

resistance. Among the highly resistant were representatives of *S. demissum* Lindl., group III, *S. demissum*, group II and *S. demissum* f. *adpressoacuminatum* which at -5° C. shewed no injury whatever.

165.

633.491-2.411.4-1.521.6:575(47)

SIDOROV, F. F.

633.491:575.127.2

Züchtung *Phytophthora*-widerstandsfähiger Kartoffelsorten. (**The breeding of potato varieties resistant to *Phytophthora*.**)

Phytopathology 1937 : 27 : 211-41.

An account of the Russian work at the Krasnyi Pakhar Institute on the breeding of potatoes resistant to *Phytophthora infestans*.

The great majority of the European commercial varieties are susceptible, though resistant varieties, Lützow and Schenkendorf, have recently been bred, combining in their ancestry 22 varieties. It has been found that two mutants, Tschugunka, a mutant of the variety Institut de Beauvais and Salatny, a mutant of Paul Krüger, have a higher resistance than their parents.

The Chilean forms of *Solanum tuberosum* may be divided into three groups. In the first group, consisting of varieties which have apparently been taken from Europe to Chile, only the form *thalassimum* is of interest from the point of view of *Phytophthora* resistance. The second group also has characters typical of commercial varieties and its members have been previously introduced and used in breeding work in Europe or North America; they have therefore nothing new to offer in their genotype. The third group, the endemic Chilean forms, is of interest in connexion with the building up of immunity of a polyfactorial nature.

Of the new cultivated species collected in South and Central America, *S. andigenum* is of special interest to the breeder on account of its variability and wide distribution. The Colombian and Bolivian forms are the most promising from the point of view of resistance to *Phytophthora* and tuber formation under long day conditions. The Peruvian forms are less valuable on both these scores; the most susceptible forms are found in central Peru. The Mexican and Guatemalan forms are almost as resistant as the Bolivian, but produce less tubers under long day conditions. The primitive cultivated forms have been found susceptible and are considered of much less value than *S. andigenum* for breeding for resistance to *Phytophthora*. The reaction of the wild *Solanum* species has also been tested. The geographical centre of forms immune to *Phytophthora* appears to be Mexico, where nine immune forms have so far been found. The most promising wild species, from the point of view of their systematic relationship to *S. tuberosum*, are *S. demissum* and *S. Antipoviczii*.

F_1 hybrids of *S. andigenum* and *S. tuberosum* usually shew about the same order of resistance as their parents, with a tendency for the *tuberosum* parent to make its influence more strongly felt than that of the *andigenum* parent. In some cases forms more resistant than either parent appear in the F_1 . The behaviour with respect to tuber yield and starch content is much the same and as the three characters are inherited independently it appears possible to breed better varieties than those now in cultivation from such crosses, though immune forms are not likely to be obtained.

Hybrids between *S. demissum* and *S. tuberosum* though immune to *Phytophthora* are of little value on account of their low yield. It appears possible, however, to breed valuable forms, immune and surpassing the cultivated parent varieties in starch content, by repeated back-crossing with *S. tuberosum*.

S. semidemissum is believed to have arisen from a cross between *S. demissum* and *S. Antipoviczii* and combines the immunity of both. It is very sterile but hybrids have been obtained from the cross with the *tuberosum* variety Rotkaragis. The hybrids are immune to *Phytophthora* but of low yield and very sterile.

S. Antipoviczii is much more difficult to cross with *S. tuberosum* than *S. demissum* and only three crosses have been made, involving the varieties Mirabilis, Epicure and Imperator. The hybrids were all resistant and resembled *S. Antipoviczii* more than *S. tuberosum*. Their yield was very low. Only the Mirabilis hybrid was sufficiently fertile to produce F_2 and back-cross progenies. These again were all immune. The back-crosses with *S. tuberosum* gave a

better yield than the F_2 plants, but the latter were more fertile. The influence of *S. Antiporiczii* was very marked in both F_2 and back-crosses. Some forms had a higher starch content than the *tuberosum* parent.

It appears possible that further back-crosses to *S. tuberosum* may yield useful forms, but the sterility of the first back-cross is likely to cause difficulties.

In conclusion the importance of physiological races of the fungus is mentioned.

Extensive tabular data on the species and hybrids studied are given.

166. SCHULTZ, E. S., CLARK, C.F.,
 STEVENSON, F. J. and
 RALEIGH, W. P. 633.491-2.8-1.521.6:575.11
Resistance of the potato to latent mosaic.
 Amer. Potato J. 1937 : 14 : 124-27.

The reactions to latent mosaic of seedlings from the crosses S 41956 x Katahdin, and S 41956 x S 45075 and of the parents were tested by the method of grafting with plants of Green Mountain containing the latent mosaic virus (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 690). Katahdin gave a necrotic reaction only. One shoot of S 45075 developed light green foliage while three remained apparently healthy, though inoculations from these to *Datura stramonium* shewed that they harboured latent mosaic. S 41956 is immune. Of 203 seedlings from S 41956 x Katahdin, 37 per cent were immune and shewed the aerial tuber reaction, 23 per cent necrotic, 16 per cent mottled with light green foliage and 24 per cent were apparently healthy but carried the virus. Of 135 seedlings from S 41956 x S 45075, 37 per cent were immune, none developed necrosis, 36 per cent developed mottled or light green foliage and 27 per cent were apparently healthy but carried the virus. These results shew that S 41956 transmits its immunity to a high percentage of its progeny and that S 45075 is genetically different from Katahdin with respect to the necrotic type of response to latent mosaic.

167. 633.492:581.6
(Non-sweet varieties of the sweet potato).
 Soviet Subtropics 1937 : 2 (30) : p. 112.

Certain varieties have now been produced by the Research Institute for Humid Subtropics that are no sweeter than the common potato, which they excel in fineness of flavour and nutritive properties.

168. NODA, K. 633.492:582(52)
(Abstract of group classification and varietal descriptions of Formosan varieties of sweet potatoes and their physiological studies on the blooming).
 J. Ass. Agric. & For. N. Formosa 1936 : 1 : No. 1 : 1-28.

In Part I of this paper previous systems of classification are discussed. The author's system is based on the study of 386 varieties and the criteria selected were morphological and other characteristics not so variable as others under Formosan conditions i.e. the classification was adapted to the particular circumstances of the district. An instance of certain characters peculiar to local varieties is given by long stems, which are frequently found in Formosan varieties, but rarely in foreign types.

Different correlations were noted between characters such as colour of stem and of tuber. Plants with purple stems have generally been regarded as producing purple potatoes and plants with green stems, white tubers; but though this is true of the Okinawa variety, no such relationship is found in Formosan varieties and in the varieties of Japan proper merely a tendency towards such a correlation exists.

Part II discusses the physiology of flowering and photoperiodism with the identification of three main types—short day, intermediate and indifferent to length of day.

Flowering is further discussed from the point of view of external factors such as temperature, light and internal factors such as plant metabolism, osmotic pressure, etc.

(Résumé of results and objects of the research work of the Central Breeding Station, SOJUZNiKhI).

SOJUZNiKhI Tashkent 1936 : Pp. 95.

The work contains the following articles of interest to plant breeders:—

S. S. Kanaš. *Breeding American varieties of cotton.* (pp. 3–13).

Among the new mid-late selections of American cotton are Kolkhoznik (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 399); No. 8582 with 20 per cent increase in yield, a lint length of 29–30 mm., ginning out-turn of 36 per cent combined with earliness and drought resistance, making it suitable for northern zones; Pakhtator giving improved yield and high lint quality, reaching 31–33 mm. in length; No. 8427 with lint 31–33 mm., ginning out-turn 36 per cent, large bolls and excellent yield in the south.

Some of the new hybrids combine a lint length of 30–31 mm. with ginning out-turn of over 40 per cent.

In mid-early cottons No. 20042 excels all others in yield and quality of lint and in ginning out-turn; Nos. 1897 and 1896 exceed the standard by 10–15 per cent in yield, with a lint length of 30–32 mm. and ginning out-turn of 34 per cent.

Early varieties 4–20 days earlier than the standard Schroeder in northern districts and superior in yield (by 5–10 per cent) and in quality and ginning out-turn have been produced; also long-fibred varieties with lint 38–42 mm. in length, combined with moderate earliness and good yield.

Several varieties possessed of improved drought resistance are noted, others tolerant of saline soil, partially wilt-resistant, and with compact growth and other characters favourable for mechanical harvesting. Certain lines with naked seeds and good agronomic qualities are now also available.

In *G. herbaceum* strains have been selected having lint up to 32 mm. in length, others with ginning out-turn of up to 40 per cent and yet others possessed of large bolls, high yield, extreme earliness or non-dehiscent bolls.

A. I. Avtonomov. *Breeding Egyptian cotton.* (pp. 14–17).

By individual plant selection it has been possible to isolate from a line of Ashmouni a strain similar to Pima in morphological characters but exceeding it by 8–12 per cent in yield and from Pima several varieties exceeding it by 4–5 per cent in ginning out-turn and 10–20 per cent in yield.

A selection which has been made from the variety Janovic is 5–8 days earlier than Pima, with a lint length of 38–40 mm. and ginning out-turn of 30 per cent, giving in consequence an excess over Pima of 20–30 per cent in lint yield. A line from Giza 7 has an unusually large number of locks per boll, reaching five in some, and also exceeds the parent in lint length. Other varieties superior in strength, uniformity, yield or length of lint have also been selected. From a Pima x Ashmouni cross a line exceeding the parents by 5–8 days in earliness has been isolated.

In the F₄ of the hybrids with *S. peruvianum*, families were obtained with greatly increased boll size, some having 30–32 seeds per boll, with a yield of 5–6 gm. seed cotton per boll, combined with the lint quality and earliness characteristic of *G. barbadense*.

Ja. D. Nagibin. *Testing new American and Egyptian cotton selections with the object of devising a plan for their more rational utilization in cotton-growing districts.* (pp. 21–22).

Studies of the new hybrids and selections have shewn that each of the old established varieties of American cotton can now be replaced by an improved strain, superior either in earliness, enabling it to be grown in hitherto unsuitable areas, or in quality or simply yield.

The same will shortly be true for Egyptian cottons too.

Ja. D. Nagibin. *Testing the degree of cross-pollination in cotton.* (pp. 27–28).

The amount of cross-pollination observed varied between 4 and 9 per cent according to variety, being least in the varieties with spreading, branching habit.

V. I. Kokuev.

On the question of ginning out-turn in cotton.
(pp. 31-32).

Figures are given which shew how transgressive segregation may occur in crosses between two cottons differing in ginning out-turn, with the production of lines homozygous for out-turn superior to the higher parent. Ginning out-turns of 40, 41 and 42 per cent have been obtained in this way in F_2 plants from crosses between varieties of *G. hirsutum*.

V. I. Kokuev.

Inheritance of boll size in American cotton (G. hirsutum Linn). (pp. 33-35).

A cross of Schroeder, having bolls weighing 3.0-3.5 gm., with Triumph Navrotskii, with bolls of 8-9 gm., gave an F_1 with a boll weight of 6.5 gm. and the boll weight in F_2 gave a regular unimodal distribution from 1.6 to 9.3 gm. Certain pure-breeding segregates in the F_4 combined large boll size and earliness.

In certain other crosses, of parents differing in lock number and lock size, positive transgression of the parental limits occurred.

V. I. Kokuev.

Inheritance of seed pubescence in cotton. (G. hirsutum Linn). (pp. 36-37).

Four naked seeded cottons were crossed with a number of forms with normal fuzz. Two of the four varieties gave F_1 plants bearing naked seeds, one gave an F_1 with intermediate pubescence and the fourth an F_1 varying from intermediate to full fuzz. The ratio of naked to pubescent seeds in the F_2 varied in different crosses, being in some 63:1 and in others as much as 253:1.

The naked seeded parent had a ginning out-turn of only 4-6 per cent and transgressive inheritance occurred in F_2 , forms without lint occurring together with others superior to the normal parent. Although there was a general association between naked seeds and low ginning out-turn, some of the naked seeded segregates were not inferior to the normal parent in ginning out-turn.

V. I. Kokuev.

Inheritance of morphological characters. (pp. 39-40).

In an F_2 consisting of 786 plants from a cross of two varieties of American cotton, 585 had petal spot and 201 were without; in another F_2 of 549 individuals there were 417 with and 132 without petal spot. In *G. herbaceum* 157 with and 56 without this character were obtained and the latter bred true. Monofactorial inheritance was found also in respect of pollen coloration, petal coloration and leaf pigmentation. Brown versus white lint gave mono-, bi- and tri-factorial ratios.

S. S. Kanaš.

Interspecific hybridization between cotton species differing in chromosome number. (pp. 41-42).

In all the crosses *G. barbadense* x *G. arboreum*, *G. hirsutum* x *G. herbaceum*, *G. barbadense* x *G. herbaceum* the F_1 had 39 somatic chromosomes, were self-sterile but gave seed when back-crossed with the 52-chromosome parent. The fertility in the back-cross progeny was greater than in the F_1 , reaching 100 per cent in certain individuals, though others were of varying degrees of sterility, even in some cases completely sterile. Transgression of the parental limits was observed in respect of most morphological characters, and characters unknown in either parent occasionally appeared; thus lint lengths of up to 50 mm. appeared and forms superior to the parents in boll size, ginning out-turn and earliness occurred. Most forms shewed also a greater propensity to cross with the 52-chromosome cottons and to a certain extent also with the 26-chromosome group.

Most plants of the back-cross progeny have chromosome numbers in the neighbourhood of 52, but individuals with $2n = 65$ occurred in the cross (*G. barbadense* x *G. herbaceum*) x *G. barbadense*. The selfed progeny of these back-crosses also shewed very varied segregation, which became less in the later generations where some individuals combined a lint length of 38-39 mm. with a ginning out-turn of 36-38 per cent, others a length of 39-42 with an out-turn of 35-36 per cent; segregates with lint lengths up to 45 mm. occurred and some hybrids had cleistogamous flowers. All these forms cross well with Egyptian cotton and are to be used in breeding work.

K. A. Vysotskii.

Interspecific hybridization in cotton. (pp. 43-44).

The various types of behaviour likely to be found in interspecific cotton crosses are indicated.

Large numbers of such crosses in the first to sixth generations are at present under investigation.

K. A. Vysotskii. Work on experimental production of mutants in cotton. (p. 45).

Regeneration from a wound callus is extremely rare in cotton. Cuttings will, however, root with ease and from these roots, some of which may be mutants, stem regeneration is possible by cutting down the aerial part of the plant.

Experiments are also being made with the action of ultra-short light waves on the seeds.

N. N. Konstantinov. Investigation of the "wild" species (ancestors) of Gossypium. (pp. 47-48).

Studies of the morphological and photoperiodic characters of the wild species of *Gossypium* and their behaviour on crossing have led to the following conclusions:—

G. Davidsonii should be retained in the genus *Gossypium*; it has no morphological feature justifying its exclusion and has given a partially fertile hybrid with *G. hirsutum* in which the characters of the latter species were largely dominant; the F_2 gave segregates varying from exceptionally early to perennial and a wide range of morphological characters.

G. anomalum gave one boll in crosses with *G. arboreum* and the F_1 was back-crossed successfully with *G. arboreum*; *G. anomalum* should therefore be retained in the genus *Gossypium*.

G. lanceaeforme was crossed with *G. Davidsonii* and *G. peruvianum* and though the bolls were abnormal in form there is no reason for excluding the species from the genus.

Observations are also being made on *G. Stocksii*, *G. Kirkii*, *G. Harknessi* and *G. Sturtii*.

K. A. Mikhailova. The morphology of cotton chromosomes. (p. 52).

The karyotype of all the Old World cottons examined was substantially the same. The 52-chromosome cottons contained 26 larger and 26 smaller chromosomes, though no such clear difference as was observed by Skovsted could be detected; moreover in *G. barbadense* and *G. hirsutum* the satellites characteristic of the Old World group were absent, though they were found in *G. Hopii*. The variety Navrotskii was different from other members of the species *G. hirsutum* examined in having two large satellites with a constriction.

P. A. Baranov and M. S. Kanaš. Chromosomes of cotton hybrids and their behaviour in the reduction division. (p. 53).

Meiosis in American x Egyptian hybrids was normal, there being 52 chromosomes. In *G. hirsutum* x *G. herbaceum* tri-, tetra- and pentavalents were formed in addition to bivalents. A back-cross (*G. barbadense* x *G. herbaceum*) x *G. barbadense* in which the somatic chromosome number was 65, indicated non-reduction in the 39-chromosome hybrids.

The somatic number 39 was observed in the following hybrids (1) *G. barbadense* x *G. arboreum*, (2) *G. hirsutum* x *G. herbaceum*, (3) *G. barbadense* x *G. herbaceum*. All were self-sterile but gave seed by back-crossing.

I. D. Romanov. The reasons for the difficulty in crossing distant species of cotton. (p. 54).

An examination of the styles after pollination between New and Old World cottons shewed that sterility was not due to the failure of the pollen tube to reach the ovary.

V. A. Novikov. Germination of cotton in salt solutions of different concentrations. (p. 72).

The cotton plant is most sensitive to salts at the time of germination and by germinating in van t'Hoff-Richter solutions of varying concentration it was possible to find salt-resistant forms in all the main cotton species.

I. M. Judanov. Work of the grain breeding section of the Central Breeding Station 1934-1935. (pp. 73-77).

Improved varieties of wheat have been obtained by selecting promising ears and plants from the fields and multiplying all the best segregating lines concurrently, so as to have enough material ready when the results of trials shewed any one of them to be satisfactory. This method has been used with success in hard and soft wheats and in barley.

Crosses have been made between *Hordeum vulgare* and *H. bulbosum* and between wheat and *Agropyrum* and *H. bulbosum* for the production of perennial forms.

170. VARUNTSJAN, I. 633.51:575(47-9)
(Outlines and prospects of breeding work with American cotton in Transcaucasia).

Sovetskii Khlopok (Soviet Cotton) 1937 : No. 1 : 55-62.

The new varieties produced by the Azerbaijan cotton station have entirely replaced the earlier grown varieties. Of these No. 915 was produced by selection from the local strain King Karajazskii; it is early, cold-resistant, highly wilt-resistant and yields nearly as much lint as the mid-late varieties, having a very large boll and lint 28-29 mm.; its defect is insufficient drought resistance.

No. 111 was produced by selection from 169, from which it is distinguished by longer lint (by 2 mm.) and 3 per cent greater ginning out-turn; this gives it an excess yield of 10-15 per cent. Its lint length is 29-30 mm. It is susceptible, however, to wilt.

No. 0246 is a selection from a local population; its main feature is the unusually vigorous germination of the seeds and it is also drought resistant. Owing to its boll structure it is easier to pick than most varieties, though it does not shed. The lint length = 29-30 mm. and is very uniform. This selection is also susceptible to wilt.

No. 0491 is a selection from Acala, having large bolls and high yield; it is mid-late and partly wilt-resistant, with a lint of 30-31 mm. and good spinning quality.

Two early varieties 915 and 1306 were crossed in 1930 and a great range of hybrids has been obtained, from ultra-early to mid-early and combining the valuable properties of the parents, such as the wilt resistance, large boll, high ginning out-turn of 915 and the fecundity of Schroeder; the lint length of the hybrids varied from 29 to 32 mm. The best selection 01301 exceeded the parent 1306 by 2-3 days in earliness and by 21 per cent. in yield, the yield of the first pick being as much as 60 per cent greater. Many of the other hybrids are also highly promising.

Among the mid-early group a segregate from a natural hybrid of King Karajazskii, No. 01064, exceeds the local standard by 20 per cent in yield and by 2 mm. in lint length and has extremely large bolls, combined with great wilt resistance.

171. MAL'TSEV, A. M., 633.51:575(5)
 KANAS, S. S.,
 AVTONOMOV, A. I. and
 NAGIBIN, S. D.
(Outlines and prospects of cotton breeding in Central Asia).

Sovetskii Khlopok (Soviet Cotton) 1937 : No. 1 : 47-54.

The great improvement in output of the new varieties such as 8517 that combine increased yield with greater ginning out-turn and lint length, is emphasized. The new varieties also contain 1-2 per cent more oil in the seeds.

One of the main advances in cotton breeding has been the speeding-up of the methods. New varieties are now produced in three years. To do this the maximum number of hybrid combinations is made in the first place, e.g. in 1936-37, 1,000 different combinations of American cottons and 1,200 of Egyptian were made. In breeding for earliness the parents are chosen on the principles of phasic development, for ginning out-turn parents are chosen so that one has a large number of fibres, the other very heavy fibres. The authors deny that unfavourable correlations may prevent any desired combination of characters being made, given a sufficient knowledge of the initial material.

Two new mid-season varieties, C52 and C51, seem to be going to excel 8517, 36M2 and Pakhtator, having a lint length of 32-33 mm., ginning out-turn of 38-39 per cent, large bolls, compact habit of growth and a yield of 10-15 per cent more than the above varieties. Two new mid-early varieties, 1896 and 1897, exceed the standard 169 by 20 per cent in yield and have lint length 31-33 mm. and ginning out-turn 34 per cent; and various new early cottons, with 31-34 mm. lint length and large bolls promise to provide very much improved early varieties.

A series of American cottons with thin, silky lint 38-41 mm. in length has been produced; they have a ginning out-turn of 32 per cent and exceed Navrotskii in yield.

Among the Egyptian cottons No. 35-1 is 10-15 days earlier than Maarad, which it exceeds

by 15–30 per cent in lint yield, in bad years by as much as 50 per cent; it has staple of 36–38 mm. and ginning out-turn of 33–35 per cent, the lint being unusually strong; a selection of it with 40–42 mm. lint length has been obtained. Other promising early Egyptians are also described, all being less susceptible to gummosis than Pima and Maarad and more resistant to cold.

Several wilt-resistant lines have been isolated, one of the best being a selection from Hallmark with lint length of 37–40 mm. Certain selections with bolls weighing 10–12 grm. and Sea Islands with lint up to 50 mm. also deserve mention.

172. VELLASCO, E. 633.51:575.11:581.45
Hereditariedade da forma da folha do algodoeiro. (**Inheritance of the form of the leaf in cotton**).
Rodríguez, Rio de J. 1936 : 2 : 197–201.

A plant from the fifth selfed generation of the variety Webber Delta Type with normal leaves was crossed with a form having extremely short leaves with 3–5 very narrow lobes; this plant was found in a field of the same variety and may be either a mutant or segregate from a natural cross with Okra; in leaf type it is almost identical with *G. Schottii*.

The F_1 was intermediate in both reciprocal crosses. It was selfed and back-crossed and the results conformed with a Mendelian interpretation in the presence of one pair of factors.

173. HARLAND, S. C. 633.51:575.11.061.633:575.127.2
Chlorophyll deficiency and modifying factors in New World cotton.
Z. indukt. Abstamm. -u. VererbLehre 1937 : 73 : 49–54.

Chlorophyll deficient, $c^{ha}c^{hb}$, occurring in the F_2 of crosses between *Gossypium barbadense* of the constitution $C^{ha}C^{hb}$ and *G. hirsutum* of the constitution $c^{ha}c^{hb}$, was transferred by back-crossing to *G. hirsutum* and *G. barbadense*.

In *barbadense*, the expression of the character was very severe and for the most part chlorophyll deficient seeds were non-germinable and lighter than normal seeds, sometimes with minute embryos. In the *hirsutum* genotype chlorophyll deficiency was manifested as a pale yellow form, lethal in the seedling stage. The genotype $c^{ha}c^{hb}$ is therefore lethal and non-germinable in *barbadense* but lethal and germinable in *hirsutum*.

Owing to segregation of the different systems of modifiers of the two species, viable chlorophyll deficient types can be obtained in the F_2 of *barbadense* x *hirsutum*. Such types have yellowish green cotyledons and normal green leaves in the adult stage. The rate of progress of disadvantageous mutants towards normality as envisaged by Fisher is therefore enormously accelerated in interspecific crosses.

174. SMIRNOVA, M. I. 633.51:575.127:581.192
633.51:581.48:575.22
(**Interspecific and intraspecific chemical variation of cotton seeds**).
Bull. Appl. Bot. Leningrad 1936 : Ser. III (15) : 227–40.

Studies of a number of varieties of cotton shewed that in most cases increased oil content of the seeds is accompanied by increased gossypol content. As a preliminary to the identification of forms with a low gossypol content a study of varietal differences in this characteristic was made and a positive correlation was observed between the number of glands present in histological sections of seeds and the percentage content of gossypol in the different varieties. This finding could, it is suggested, be used as a method of selecting plants with a low gossypol content.

The gossypol and oil content of individual plants of a variety differed little; but plants of the same variety, grown in different localities exhibited variation in their chemical composition. As regards species differences, figures are cited shewing that varieties of *Gossypium herbaceum* contain the least gossypol, a low oil content and a high percentage of protein, while forms of *G. barbadense* apparently have a high oil content.

175. AVTONOMOVA, N. 633.51:575.127.2:581.143.26
(On the question of increasing the weight of lint per boll in Egyptian cotton).
 Sojuznixi Markazij Seleksija Stansasinin Maqalalar Toplami (Collection of articles from the Central Breeding Station SOJUZNIKhI) Tashkent 1936 : 120-28.

In the attempt to raise the boll size of Egyptian cotton, crosses were made between a number of varieties of *G. barbadense* and various large-bolled forms of *G. peruvianum*, which were induced to flower by means of short-day treatment. Only the hybrid combinations with the largest bolls were retained.

The hybrids when grown out-of-doors were intermediate, with a somewhat greater resemblance to *G. peruvianum*: sympodial branches are formed but all the buds drop off and no flowers are formed. Seed was obtained by growing the hybrids under short-day conditions. The F_2 so obtained, consisting of 912 plants, was grown in the open and shewed wide segregation; 196 of the plants were of the annual type. In seven of them the bolls were large and of the *G. peruvianum* type and one plant gave a total yield of 161.2 grm. raw cotton.

The seed obtained was used to produce an F_3 and among 77 families so produced only four were perennial. The progeny of the seven large-bolled plants segregated both for boll size and for morphological characters. The boll weight varied from 1.1 to 6 grm.; in some a larger quantity of lint was produced on account of the large number of seeds per boll, in others on account of the large size of the seeds, whilst in some these two features were combined. In time of maturity most of the F_3 plants were of the Egyptian type, the average being about the same as Pima or Maarad.

The length, elasticity and lustre of the Egyptian cottons were dominant in the F_1 and in these respects too there was segregation in the F_2 , the lint length varying from 28 to 45 mm. Lint length varied from 35 to 45 mm. in the F_2 and F_3 progeny of the large-bolled plants and the highest lint yields were obtained from the crosses involving Pima and a large-bolled Peruvian type.

Back-crossing the F_1 to Egyptian gave all annual progeny and to Peruvian all perennial; no large-bolled segregates appeared in either back-cross.

From the above results, together with a preliminary examination of the F_4 , it is concluded that in a few more years it should be possible to produce Egyptian cottons with bolls weighing 4.5-6 grm. and characterized at the same time by productivity, high lint quality and in earliness approximating to that of Pima.

176. KONSTANTINOV, N. N. 633.51:575.127.2:581.143.26
(Perennial cottons and their importance in breeding work).
 Sojuznixi Markazij Seleksija Stansasinin Maqalalar Toplami (Collection of articles from the Central Breeding Station SOJUZNIKhI) Tashkent 1936 : 72-79.

The perennial cottons, where grown under curtailed illumination display an unexpected range of variation in type. Some of these forms are considered useful for hybridization, e.g. forms of *G. peruvianum* possessed of unusually large bolls. Some of these have also very long lint (up to 40 mm.) and are being crossed with Egyptian cottons to increase the boll size of the latter.

Some of the perennial forms are highly disease resistant and one species at least, *G. lancaeforme* Miers, is frost resistant.

177. SOKUROVA-VYSOTSKAJA, O. V. 633.51:575.127.2:581.165
(On the question of the quality of the lint of vegetatively reproduced cotton plants).
 Sojuznixi Markazij Seleksija Stansasinin Maqalalar Toplami (Collection of articles from the Central Breeding Station SOJUZNIKhI) Tashkent 1936 : 116-19.

A study of the lint obtained from F_1 hybrids of *G. hirsutum* x *G. barbadense* (Cf. Abst. 178) reproduced vegetatively shewed that no deterioration in lint quality had accrued.

178. SOKUROVA-VYSOTSKAJA, O. V. 633.51:575.127.2:677.1
(The question of the technological qualities of the raw cotton from F_1 interspecific hybrids between American and Egyptian cotton).
 Sojuznizi Markazij Seleksija Stansasinin Magalalar Toplami (Collection of articles from the Central Breeding Station SOJUZNIKH) Tashkent 1936 : 101-15.

The F_1 hybrids between *G. hirsutum* and *G. barbadense* display marked heterosis vegetatively and produce unusually large numbers of seeds, which are larger than those of either parents. Studies of the lint characters of a number of hybrids shewed them to be above the parents also in lint length, which was on an average 2.5 mm. longer than in the Egyptian parent and 10-13 mm. above the Upland parent, one of the hybrids having a lint length of 40.3 mm., while none of the parents had lint longer than 35 mm. The lint was more uniform than that of the Egyptian parent and gave much less waste than that of the Upland parent, having a high proportion of long staple fibres like Egyptian. The lint was of a fineness and a strength equal to the Egyptian and the metric number was slightly higher. In ginning out-turn the hybrids were equal to the Egyptian parent but inferior to the Upland: the number of unripe seeds was, however, great being more than in both parents and the fuzz was equal to that of the Upland parent.

Comparison with standard varieties of American and Egyptian cotton shewed some of the hybrids to be superior even to Sakellaridis.

Very satisfactory spinning tests were also obtained with the hybrids and attempts are being made to propagate them vegetatively.

179. VELLASCO, E. 633.51:575.22:581.45
 Variação da forma da folha dos algodoeiros Mocó e Rim de Boi. (**Variation in the leaf form in the cottons Mocó and Rim de Boi**).
 Rodriguésia, Rio de J. 1936 : 2 : 275-82.

Observations were made on the leaf form of the variety Rim de Boi (*Gossypium brasiliense*) and Mocó (*G. vitifolium*), using the two formulae of Hutchinson $\frac{A}{B}$ and $\frac{A}{E}$. In Rim de Boi the correlation between these two values was much lower than that observed by Hutchinson in Egyptian cottons and did not amount to more than -0.19. The results of the measurements of 105 leaves of one variety and 110 of the other are given in the form of frequency distributions and graphs, the value $\frac{A-B}{E}$ (Leake's formula) being given also for comparison. The variation of this value was higher than that of the other two. The variation in all was high, however, and in most cases trimodal, indicating the heterozygosity of the populations examined.

180. DOAK, C. C. 633.51:581.46:581.162.32:578.08
 633.51:581.163
The pistil anatomy of cotton as related to experimental control of fertilization under varied conditions of pollination.
 Amer. J. Bot. 1937 : 24 : 187-94.

The ontogeny and structure of the pistil of cotton are described. There is a tendency for pollen grains placed on a given lobe of the stigma to fertilize ovules in the corresponding locule, which can be marked at the time of pollination. It is therefore feasible to use certain locules simply to produce sufficient non-hybrid seed to ensure setting of the boll while other locules are used for obtaining distant crosses or parthenogenetic embryos. As pollen tubes can cross over to a different locule it is necessary to have a method of distinguishing the normal seeds produced in the experimental locule. This can be done if the female parent is homozygous for *r* (green leaves) and the pollen used for producing the normal seed carries *R* (red leaves).

In an experiment to produce parthenogenetic seeds one or two stigma lobes were removed from each of a large number of pistils on green-leaved plants (*rr*). The remaining ones were

pollinated with *R* pollen. One of the 378 seeds obtained from decapitated locules gave a green seedling, the rest, and those produced in the untreated locules were red. The green individual must therefore have been produced parthenogenetically or have been due to a mutation. It was calculated that 3342 ovules were available for parthenogenetic development. In another experiment the stigma was split in two between lobes and the two halves separated by a card while pollen of the same species [*G. Arvadum*] was applied on one side and of a Chinese cotton on the other. The *R-r* test was again used. No hybrid seed was obtained, though 5369 ovules were available and a set of 69.9 per cent fruits was obtained. The Chinese pollen was apparently able to cause an increased set, for the set in the previous experiment was only 37.2 per cent.

181. 633.51 *G. herbaceum* -1.524.4

KONSTANTINOV, N. N.

633.51:575

[The use of (*Gos. herbaceum* L.) in practical breeding work].

Squjuznik Markazi) Selektsiya Stansastuin Nagalalar Toplamii (Collection of articles from the Central Breeding Station SOJUZNIKHI) Tashkent 1936 : 80-85.

Recent extensive studies of the species *G. herbaceum* have revealed the existence in it of a number of extremely valuable types for breeding. Among those mentioned are forms from western China (Turkian region) earlier than any other known cottons, reaching maturity in 90-95 days, which is 15-20 days before the earliest Upland varieties. Early cottons were also found in various countries in Asia Minor. The form from Turkia (var. Kuldianum of Zaitsev) in spite of its great earliness, is yet slow in the period from bud formation to flowering and it is believed that by crossing it with varieties that are rapid in this period still earlier forms would be attained.

Some of the forms collected in Afghanistan, Iran and central Asia have quite large bolls weighing up to 5.5 grm. Others had lint up to 32 mm. in length, and some had quite high spinning percentages - up to 37 per cent, these latter types have unfortunately the disadvantage of being late in maturing.

Special interest is attached to the forms with non-dehiscent bolls for breeding cottons resistant to wind damage and suitable for mechanical harvesting, since no loss accrues if the bolls are left on the plants until all are ripe.

Most of the forms are more drought-resistant than the American and Egyptian cottons, some being quite exceptionally tolerant of unfavourable conditions.

These various desirable characters occur separately in different individuals but could no doubt be combined by hybridization, whereby unexpectedly valuable forms of this species might be produced, especially in connexion with new or unfavourable cotton areas. Some of the forms might be used with advantage in interspecific crosses too.

182. SAREJANNI, J. A. and

CORTZAS, C. B.

633.51-2.482-1.521.6

La nature de la résistance du coton au *Macrophomina phaseoli* (Mauhl.)

Ashby. [The nature of the resistance of cotton to *M. phaseoli* (Mauhl.) Ashby].

C.R. 3rd Int. Congr. Comp. Path., Athens 1936 : Sect. Path. Veg. 28-30.

A disease of cotton in Greece caused by *Macrophomina phaseoli* (Mauhl.) Ashby, is the subject of investigation in this paper. This fungus in certain districts attacks only the Asiatic cotton variety Dadiotiro, while American varieties growing in the same districts and under the same conditions escape infection.

Anatomical investigations of young plants of both the Asiatic and the American varieties revealed certain significant differences in structure of the corky layers and other tissues.

F. M. R.

183. FAHMY, T. 633.51-2.484-1.521.6:575(62)

Immunity in plants and immunity to *Fusarium* wilt in cotton.

Rep. 3rd Int. Congr. Comp. Path., Athens 1936 : 1 : Pt. 2 : 143-51.

The first part of this paper is devoted to a general discussion on immunity and resistance of plants against disease.

In the second part the author describes in detail the experiments started in 1923 in Egypt to develop strains of cotton resistant to cotton wilt, *Fusarium vasinfectum* var. *Egypticum*. A standard method for the study of the genetics of resistance was derived. This consisted in growing single seeds in small pots in soil heavily infected with a known concentration of infection and kept under optimum conditions for the growth of the parasite. Susceptible seedlings develop the symptoms of the disease about five days after germination and die a few days later. Other seedlings develop the characteristic mottling but recover, i.e. they are tolerant towards the disease. Other seedlings are immune; these may breed true to immunity or segregate.

In an immune x susceptible cross the F_1 generation is totally immune. Segregation in the F_2 generation gives an average of 75 per cent of phenotypic immunes, 15 per cent of tolerants, and 10 per cent of susceptibles. The F_2 phenotypic immunes give rise to totally immune families which breed true to immunity, or to segregating families the phenotypic immunes of which behave as those of the F_2 generation.

Tolerant plants give rise to segregating progenies from which genotypic immune families have not yet been isolated.

Susceptible plants give rise either to totally susceptible families or they segregate giving a high percentage of susceptibles.

It has been found possible to select highly resistant families by breeding for a number of generations from plants belonging to the families with the highest percentages of phenotypic immunes. At Giza there are now several strains of cotton of excellent lint quality which can be grown on heavily infected soils without loss.

F. M. R.

184. MEDWEDEWA, G. B. 633.512:581.162.5

(Types of sterility of *Apocynum venetum* L.).

Biologičeskij Žurnal (Biologicheskij Zhurnal) 1937 : 6 : 93-110.

Attacking the problem of sterility in *Apocynum* from the embryological standpoint the writer has investigated the normal embryological development—including macrosporogenesis the development of the embryo sac and microsporogenesis—pollination and fertilization, in relation to physiological and genetic sterility, and the special problem of sterility under conditions of isolation.

Four kinds of sterility and their causes were identified as follows: (1) Sterility due to inadequate facilities for insect pollination; (2) sterility due to the flower buds, flowers and fruit dropping off owing to physiological causes (e.g. malnutrition) resulting in the degeneration of the male and female sexual elements; (3) genetic sterility found in the sterile clones of the Chirchik and Chu regions and accompanied by total degeneration of the archesporial tissues, both male and female, at the time of reduction division, so that the opened flowers contain neither embryo sac nor pollen; and (4) sterility under conditions of isolation, attributed either to the anthers becoming drenched with nectar and hence failing to open, or where artificial pollination is used followed by isolation, to bad conditions of aeration and excess of nectar in the flower. The sterility found in two giant clones of the two regions mentioned is regarded as due to hybridity. No cytological aberrations were found in the somatic tissues which had 22 chromosomes like the normal fruiting type. As indirect evidence of the hybridity of these clones are cited their marked vegetative vigour, gigantism and the fact that degeneration does not set in until the formation of sex cells begins, i.e. at the reduction division when the disharmony in the chromosome complex takes effect.

It is interesting to note that the non-fruiting clone differed from the typical forms in the Chirchik region in marked pubescence of the leaves, reduced branching and (according to Borisov) considerably later maturity, as well as the gigantism and sterility already mentioned. Such valuable characters as little branching, tallness and length of fibre should be made use of in clonal selection.

185. KOSTOFF, D. 633.52:575.12:576.356.5:581.036
 (On P. V. Žukov's article on the fixing of hybrids).
 Seleksijska i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 2 :
 p. 64.

On examining seed of the constant flax hybrid produced by Žukov (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1009) the author found 32 chromosomes as in the parental forms and concludes that Žukov's pollen count was incorrect.

186. ŽUKOV, P. V. 633.52:575.12:581.143.26(47)
 (Perennial flax).

Bull. Appl. Bot. Leningrad 1936 : Ser. A (20) : 149-50.

A description of *Linum sibiricum* D.C. under cultivation at the Barnaul'skaja Experiment Station since 1930. Seed is obtainable only by cross-pollination. Attempts to inbreed it or to cross it with ordinary flax have failed. Though no breeding work has been done with it so far, in view of its resistance to frost and drought and its hardiness as regards soil conditions, it is regarded as promising material from which non-shedding varieties with good yields of fibre and oil might be obtained.

187. VIGNOLI, L. 633.526.2:576.312
 Cariologia del genere *Agave*. (The karyology of the genus *Agave*).
 Lav. Ist. Bot. Palermo 1936 : 7 (14) : Pp. 44.

The species studied are briefly described, Berger's monograph being followed in their identification.

The various stages of prophase of meiosis were studied in *A. Gilbeyi* and were found to proceed regularly except that a few cells degenerated and this appeared to be common to all the species studied.

The haploid chromosome number was determined for the following species:—*A. Rovelliana* 25, *A. Bouchéi* 30, *A. Sartorii* 30, *A. micracantha* 30, *A. Haseloffii* 30, *A. Salmiana* var. *angustifolia* 60, *A. ferox* 60 and *A. Gilbeyi* 90.

All the species studied shewed characteristic large and small chromosomes. Hybridization and the effect of the climate is held to account for the polymorphism of the species and for the decrease in sexual reproduction.

SUGAR PLANTS 633.6

188. GRANGIER, A. 633.61:575(81)
 Boletim Annual da Estação Experimental de Canna de Assucar de Campos-
 Estado do Rio de Janeiro 1932-1933. (Annual Bulletin of the Sugar
 Cane Research Station, Campos, Rio de Janeiro State, for 1932-
 1933).
 Minist. Agric. Dep. Nac. Prod. Veg. Rio de J. 1935 : Secção Technica No. 2 :
 Pp. 68.

Data are given on the performance of a number of imported canes. Among the seedlings produced one hybrid of P.O.J.2725 has proved more adapted to local conditions than the parent cane. Seeds have been obtained from the variety P.O.J.2714, hitherto supposed sterile.

189. CROSS, W. E. 633.61:575(82)
 Reflexiones sobre las variedades de cañas presentadas en la Exposición
 Permanente organizada por la Estación Experimental Agrícola. (Reflec-
 tions upon the cane varieties shewn at the Permanent Exhibition
 organized by the Estación Experimental Agrícola).
 Rev. Industr. Agríc. Tucuman 1936 : 26 : 157-72.

In a consideration of the different varieties of cane represented at the exhibition the author discusses, *inter alia*, the merits of a number of mutants: striped mutants have been obtained

in a number of different canes and it seems to be a general rule that these are higher in sugar content than the normal types. Comments are made upon a number of imported canes and their history, continuing with an outline of the progress of cane breeding in Argentina. Owing to frosts and other difficulties it has frequently been necessary to have the pollinations done abroad and the seed imported to Argentina. Canes are now being produced which are suitable for each of the various regions of the country.

633.61:576.16 Big Tanna
633.61:575.127.2

190. CHARMOY, D. d'EMMEREZ de
La Big-Tanna. (**Big Tanna**).
Rev. Agric. Réunion 1936 : 41 : (N.S.) : 367-68.

Further reasons for the hybrid origin of Big Tanna cane are put forward and the suggestion is made that the original cross was between *Saccharum officinarum* and the wild cane of New Guinea, *S. robustum*.

191. CARRERAS, J. 633.61:581.4
633.61:582
Notas sobre la botánica de la caña de azúcar. I. Morfología de la caña de azúcar. II. Taxonomía de la caña de azúcar. (**Notes on the botany of the sugar cane. I. Morphology of the sugar cane. II. Taxonomy of the sugar cane**).
Bol. Minist. Fom., Lima 1937 : No. 10 : Pp. 42.

In the first half the morphological features characteristic of the genus *Saccharum* and its various species are described and in the second half the literature of the systematics of the species is reviewed for Spanish readers.

192. CLAUS, E. 633.63:575
Neue Aufgaben der Zuckerrübenzüchtung. (**New problems in sugar beet breeding**).
Die Zuckerrübe in der Erzeugungsschlacht. Gebrüder Dippe A.G. Quedlinburg : 28-34.

Certain small-leaved strains of sugar beet recover more rapidly from attack by *Cercospora beticola* by their power to produce another crop of small leaves without as great a drain on their reserves of sugar as in the large-leaved varieties.

An attempt is being made to combine high sugar content with resistance to the virus disease Curly Top.

Types are also being bred that are suitable for cultivation in the districts near the sea.

For some inland districts the demand is for a leafy type for use as fodder and this character is being combined with high sugar content.

The breeding of non-bolting beets has been discussed elsewhere (see "Plant Breeding Abstracts", Vol. VII, Abst. 247).

193. SESSOUS, G. 633.63:575
Zuckerrüben und Zuckerrübenzüchtung in der Erzeugungsschlacht.
(**Sugar beets and sugar beet breeding in the production campaign**).
Die Zuckerrübe in der Erzeugungsschlacht. Gebrüder Dippe A.G. Quedlinburg : 13-18.

The importance of sugar beet production as a source of sugar and indirectly of fats is stressed. It is possible that breeding for sugar content has gone as far as is possible without a decrease in yield.

A non-bolting strain is now the most urgent objective with disease resistance next in importance.

194. SCHNEIDER, F. 633.63:575.127.2
Nouvelle contribution à l'étude du croisement de la betterave sucrière avec *Beta trigyna*. (**A new contribution towards and study of the cross between the sugar beet and *B. trigyna***).
Publ. Inst. Belge Amélior. Better. 1937 : 5 : p. 86.
The hybrids from the cross sugar beet x *B. trigyna* were mainly sterile and back-crossing was necessary.
The identification of *B. lomatogona* was made an object of study.
195. COLIN, H. 633.63:575.127.2:581.162.3
Sur une expérience de vicinisme. (**An experiment of vicinism**).
Publ. Inst. Belge Amélior. Better. 1937 : 5 : 155-57.
Beta maritima, *B. patellaris* and sugar beet, var. Vilmorin A, were all grown together under conditions most favourable to vicinism. None of the resulting progeny in the least resembled *B. patellaris*. All the seeds of *B. maritima* were true to type. Only the seeds of the sugar beet shewed evidence of hybridization with *B. maritima*.
196. BOONSTRA, A. E. H. R. 633.63:581.144:581.192:575
Rasverschillen bij bieten : I. Het verloop van de bladontwikkeling bij 2 Kuhnstammen. II. Een ontbladeringsproef met 2 Kuhnstammen. (**Varietal differences in beets : I. The course of leaf development in two Kuhn strains. II. An experiment on the effect of the removal of leaves made with two Kuhn strains**).
Meded. Inst. Suikerbiet. Bergen-o.-Z. 1937 : Afl. 5 : 79-102.
On comparing two strains A and Z each obtained by cross fertilization within their respective lines and genetically homogeneous, differences were found in the number of leaves formed, the length of the petioles and rate of leaf growth in the two strains. Moreover, removal of the older leaves in both strains resulted in a greater reduction in the dry matter content and sugar content in the A beets than in the Z beets for the maximum number of leaves removed—and this, in spite of the fact that normally A is the higher producer.
197. KAGAN, J. 633.63-1.525:575.42
La question du choix des variétés de betteraves sucrières. (**On the choice of varieties of sugar beet**).
Publ. Inst. Belge Amélior. Better. 1937 : 5 : 159-61.
As a result of experiments carried out in the U.S.S.R., the importance is urged of selecting varieties of sugar beets that are most suited to the climate and soil in which they are to be grown and that can utilize artificial manures to the greatest possible extent.
198. GAËL, A. 633.68
(**A new starch-bearing plant of the sand desert**).
Bull. Appl. Bot. Leningrad 1936 : Ser. A (19) : 61-64.
A description is given of the new plant dju-djmyr (closely allied to the species *Ferula caspica*) whose roots contain 70-80 per cent starch and are used in the deserts of Kazakstan as a food-stuff. Details are also given of the geographical distribution of the plant and the chemical composition of the roots and the flour prepared from them; in sugar and starch content it compares very favourably with other starch-bearing plants.

STIMULANTS 633.7

199. EGHIS, S. A. 633.71:575:581.143.26.03
(**Experiments on the genetics and breeding of tobacco and the theory of individual developmental stages**).
Bull. Appl. Bot. Leningrad 1936 : Ser. A (19) : 5-14.
The results of crossing forms differing in the nature of the developmental stages indicate that not many genes are responsible for each individual phase. Plants differ in the degree of their requirements in a given stage, e.g. *Nicotiana tomentosa* fails to flower if removed from short-day

conditions even after the flower buds have formed. In crosses with different forms of *N. Tabacum* the hybrids are of varying types: hybrids with an early variety were capable of flowering in the Leningrad region, hybrids with a later variety failed to flower though they were less sensitive than the parent *N. tomentosa*. A triploid of this latter combination, having two *Tabacum* genomes, was still incapable of flowering in Leningrad, though soon did so after a brief treatment with short-day. The famous short-day type Maryland Mammoth when crossed with long-day forms gives forms that flower under long-day conditions. These facts indicate that the precise requirements in the photo-stage are determined by polymeric genes and that short-day reaction is recessive; Maryland Mammoth by its origin would appear to be a recessive mutant: by the loss of the long-day genes through mutation the hypostatic short-day genes of the *N. tomentosa* genom in *N. Tabacum* are manifested. In the progenies of some of the three-species hybrids and the hybrids of polyploid *N. Tabacum* with other species, though most of them are late, occasional very early forms have appeared, apparently resulting from a re-assortment of the chromosomes and the combination of several chromosomes carrying the early genes.

The Sumatra wrapper type was crossed with a very early hybrid of *N. Tabacum* x *N. sylvestris* and in the F_3 there appeared certain plants of the Sumatra type of the desired earliness; these were back-crossed with the original Sumatra to raise their quality while maintaining their earliness.

Similarly Maryland Broadleaf, which is too late for cultivation in the U.S.S.R., was crossed with an unusually early and also large-leaved tri-species hybrid *futurum* and hybrids were obtained in 1935 that were equal to Maryland Broadleaf in leaf size and to *futurum* in earliness, the rapid completion of the "rosette" stage characteristic of the latter type being therefore dominant. In the F_2 the earliest plants of the Maryland type are being selfed and also back-crossed with Maryland. Similar crosses between Bright and early Syrian and Persian tobaccos have shown that the F_2 contains more early individuals but the back-cross, though containing a lower proportion of these, contains a great number of forms of the desired quality.

Crosses have been made between the short-day species *N. solanifolia* and the long-day *N. paniculata*; the hybrid was early, though not quite so much so as the latter species, and fertile. These hybrids should be interesting in the study of the inheritance of earliness and may provide new synthetic forms of *N. rustica*, possibly even short-day forms.

In breeding for earliness it is important to know which of the two stages, thermo-stage or photo-stage, is the cause of lateness. *N. sylvestris* is late because of delay in the first or rosette stage, Maryland Mammoth because of its short-day requirements. A comparison of the F_1 with these two standards will indicate to which of the two types a given late variety belongs, since rapidity in a given stage is dominant in inheritance.

200.

VALLEAU, W. D.

633.71-2.8-1.521.6:575

632.8:576.16

Localization and resistance to tobacco mosaic, in *Nicotiana*.

Bull. Ky Agric. Exp. Sta. 1935 : No. 360 : 202-30.

From studies on the reaction of varieties of *Nicotiana Tabacum* and other *Nicotiana* species to different strains of tobacco mosaic the author concludes that necrotic spotting is merely an index to the degree of sensitivity of the plant to the virus and is not always accompanied by localization of the virus. Since, moreover, the common strains of tobacco mosaic are non-necrotic-spotting, this phenomenon cannot be expected to be of much use in the control of tobacco mosaic.

Necrotic spotting appears to be due to a single Mendelian factor operating with incomplete dominance (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 444).

The tobacco variety Ambalema is able completely to localize necrotic spotting virus strains in the necrotic spots and is able also to prevent non-necrotic strains entering the young tissue of the plant. Transference of this latter type of resistance with or without necrotic spotting, to commercial tobaccos, should provide a satisfactory and practical solution of the tobacco mosaic problem.

201.

633.72:575.42

Kring Benkoelen en Boven-Palembang van het Zuid- en West-Sumatra Syndicaat en van de Centrale Proefstations Vereeniging. (**The Benkoelen and Boven-Palembang Branch of the South and West Sumatra Syndicate and of the Association of the Central Experiment Station**).
Bergcultures 1936 : 10 : 1468-74.

This report contains *inter alia* the substance of a talk by Dr. Th. G. E. Hoedt on the functions and work of the Central Experiment Station, omitting, however, actual research problems and results, regularly recorded elsewhere.

The principles of tea selection including mass selection and the choice of parent plants for vegetative reproduction and of new forms for crossing are briefly exemplified.

202.

WELLENSIEK, S. J.

633.72:575.42

Kweekerijselectie, theezaad en theezaadtuinen. (**Nursery selection, tea seed and tea seed gardens**).

Bergcultures 1936 : 10 : 574-77.

The object of selection is to obtain the lowest possible cost price through increased yield per unit area and highest selling price through selection for quality.

Nursery selection results in higher mean yields; it is mass selection and not every plant is better. The increase varies because of other factors than growth vigour.

A further advantage is that selected plants give better results. In one experiment after one year there were 0.8 per cent losses of selected and 4.8 per cent of unselected plants. Also selected plants grow better and come into production earlier. As stocks also they give more successful results and quicker growth of the buddings.

Nursery selection involves the handling and waste of large numbers of plantable stumps. It can be carried out at an earlier age with less labour and expense by selecting seeds which are large, and also have high specific weight, followed by close planting in rows 20 cm. apart and at from 2 to 5 cm. within the row. The seedlings are then thinned to a final density equal to 20 x 20 cm. Ordinary seed from the older seed gardens can be obtained cheaply in large quantities for use after severe selection. Otherwise selected seed from selected and isolated seed gardens will give good results without further selection.

Nursery selection can only get the best out of what is available, and is useful for obtaining good stocks for budding. The importance of clone testing and the layout of selected seed gardens is discussed shortly.

L. E. M.

203.

WELLENSIEK, S. J.

633.72:575.42

Onderzoekingen over quantitatieve theeselectie III. Kweekerijselectie.
(**Researches on quantitative tea selection III. Nursery selection**).

Arch. Theecult. Ned.-Ind. 1936 : 10 : 136-76.

Details are given from six reform seed gardens and testing gardens (already referred to in "Plant Breeding Abstracts", Vol. VII, Abst. 728) of the results from material planted after selection in the nursery.

The results are largely set out in tables and graphs (with legends in English). Correlation coefficients between weights of tops pruned in the nursery and diameter and height respectively are high and range from 0.750 to 0.964. Correlations of pruning weight with root weight and leaf weight are also high.

Seed weight was found to be of no importance.

On nursery selection the plants were divided into quintiles and the field results are given as mean for each quintile. The mean of quintile 3 was about the same as the general mean, and in some tests only quintiles 3 and 5 (i.e. the middle and best 20 per cent) were planted out. Plants in the border rows of the nursery surpassed centre plants in weight and diameter, but two years after planting out their yields were equal. Differences within the groups, however, were still shewn and are thus probably partly genetical.

Yield results in experiments 1, 3, 4 and 5 were based on only 8 pluckings, but experiments 2 and 6 shewed the practical constancy of leaf weights over a longer period.

The mean yield generally increased from low to high quintiles (whether arranged in weight or diameter, on all plants or on lower and centre plants separately). The chief irregularities

were in quintiles 3 and 4. Grouping by diameter gave fewer irregularities than grouping by pruning weight, and hence is to be preferred.

A selection of the best 20 per cent (i.e. quintile 5) always raised the yield above that of unselected material. The increases varied from 3.5 per cent (exceptionally low) to 37.2 per cent, (all statistically significant). Still closer selection of about 1.5 per cent gave increases of 19.3 to 65.9 per cent.

The correlation coefficients between pruning weight or diameter in the nursery with yield are low (about 0.1 to 0.2) but that for pruning weight or diameter at the time of cutting down with yield is high (0.746 and 0.945). Thus there is a genetical relation between vegetative characters and yield, but other factors tend to obscure this and make selection in the nursery less certain. It is a mass selection and does not apply to individual plants.

When trees selected in the field were traced back in experiments 3, 4 and 6 it was found that about 80-85 per cent of those selected for yield, 87-92 per cent of seed trees and 89-95 per cent of mother trees were derived from quintile 5, i.e. from the 20 per cent heaviest nursery plants. A few good trees also came from other quintiles.

L. E. M.

204.

LAMBERS, M. Hille Ris

Gegevens over Conuga. (**Data on Conuga**).

Bergcultures 1936 : 10 : 596-97.

633.73:575.12

633.73:581.162.51

Short notes on the history of Conuga coffee, its habit, growth, yield and suitable spacing in plantations form the main part of this article.

Highly promising results have been obtained from the cross Conuga SA 36 x BP 42. Grafts of Conuga 36 are also being artificially pollinated with BP 42. The question of self-fertility is being investigated.

205.

LAMBERS, M. Hille Ris

Kapakata-koffie. (**Kapakata coffee**).

Arch. Koffiecult. Ned.-Ind. 1935 : 9 : 105-15.

633.73:575.12

633.73 Kapakata

Full details are given of the origin and description of this wild species which was found in Angola about 1930. Young plants were raised in Angola and also at the Malang Experiment Station in 1931.

The Kapakata type of coffee is characterized by a ribbed berry, persistent calyx, very small leaves and compact habit of the plant. The various characteristics of Kapakata are compared with those of other varieties and observations at the Malang Station suggest that selection to increase the number of flowers per cluster should be successful.

Though reported as not subject to attack by diseases and pests in Angola this claim was not borne out under Malang conditions; but it appears likely to prove very resistant to drought. Crosses of Kapakata and arabica and robusta types have been made and the robusta hybrids shew very vigorous growth.

An attempt has been made to combine the good vegetative characteristics of Kapakata with the high yield and quality of the more widely cultivated types in Malang by crosses with Kents hybrids (*Coffea arabica*) and BP42 (robusta).

206.

KRUG, C. A.

Variações somáticas em *Coffea arabica* L. (**Somatic variations in *C. arabica* L.**).

Rev. Agric. S. Paulo 1937 : 12 : 101-09.

633.73:575.25

Among the cases of somatic variation observed in coffee was a plant of *C. arabica typica* in which the upper portion was typical while the lower part was very much branched and the leaves unusually small; the secondary internodes of the stem were short and the flowers were few and small, with only 4 petals and few, if any, seeds. Several plants of this type have been found. Other types found were a variegated plant and plants of the type Bourbon (*Na Na*) with branches of the type Murta (*Nana*) and vice versa.

Two chromosomal mutants were also observed, one hexaploid with 66 and an octoploid (Bullata) with 88; the octoploid has also been observed to revert to the normal tetraploid, the hexaploid being so far stable.

207. OSTENDORF, F. W. 633.74:575(92.2)
 633.74:576.16
 Cacaotypen en cacaoselectie op Java. (**Cacao types and cacao selection in Java**).
 Bergcultures 1936 : 10 : 1015-16.

The Java Criollo type of cacao and its introduction into Java are briefly mentioned. Though this type subsequently appeared to be identical with the Venezuela Criollo type, it is thought likely that hybridization must have occurred, resulting ultimately in the incorporation of certain Forastero factors in the Java Criollo type. Among the hybrids introduced at an early date are the Assinan-Angoleta, the Djatiroenggo- and the Getas-Forastero types. In a short note on early selection work and on the importance of selecting for quality as well as white colour of the beans, the characters that make for good quality are stated to be more or less independent of cotyledon colour.

Selection in future should be directed to combining the quality and desirable features of Criollo with the high production, plant vigour and resistance to pests and diseases found in Forastero.

208. ONO, T. 633.79:576.312.332
 (**On sex-chromosomes in wild hops**).
 Bot. Mag. Tokyo 1937 : 51 : 110-15.

In staminate plants of the wild hops *Humulus lupulus* var. *cordifolius* ($2n = 20$) a chain of four chromosomes is found at the first division of meiosis. By analogy with the sex chromosome complement in the hop, these are named in order, $X_1 Y_1 X_2 Y_2$. They are arranged on the metaphase plate disjunctionally and X_1 and X_2 go to one pole, Y_1 and Y_2 to the other. The pistillate plant shews ten equal pairs. The largest rod bivalent seems to correspond to $X_1 X_1$ and the largest ring to $X_2 X_2$. All megaspores have therefore $X_1 X_2$ while pollen grains carry either $X_1 X_2$ or $Y_1 Y_2$.

The somatic chromosomes were not studied, but from an abnormal pollen mother cell it was found that X_2 and Y_1 have median, X_1 and Y_2 sub-median constrictions.

AROMATIC PLANTS 633.8

209. HOLMES, F. O. 633.84-2.8-1.521.6:575.113.3
Inheritance of resistance to tobacco-mosaic disease in the pepper.
 Phytopathology 1937 : 27 : 637-42.

Two types of response to infection by tobacco-mosaic virus are known in *Capsicum frutescens* L. (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 444), mottling caused by the recessive factor l and localized necrosis followed by abscission of the infected leaves caused by the dominant allelomorph L . A third type has now been found, in the varieties Long Red Cayenne and Sunnybrook and in occasional plants of other varieties, the symptoms being yellowish primary lesions with some necrosis, followed by recovery except for scattered secondary lesions in a few plants. It is termed the imperfectly localized or delayed-necrosis type of response.

When plants of this type are crossed with mottling-type plants (ll) the F_1 hybrids shew large necrotic primary lesions followed by severe systemic necrosis, usually resulting in the early death of the plant. Back-crossed to mottling type plants, a 1:1 ratio of plants shewing systemic necrosis and plants shewing mottling was obtained. Crossing the imperfectly localized type with the localized-necrosis type (LL) gave an F_1 consisting of localized-necrosis plants. When these were pollinated from a mottling-type stock, equal numbers of plants giving localized necrosis and systemic necrosis were obtained; no mottling-type plants appeared except one plant in one cross. It is concluded that the imperfectly localized type of response is conditioned by another allelomorph of l , termed l' ; this allelomorph is recessive to L and in combination with l gives the systemic necrosis type of response.

Among large-fruited, non-pungent peppers the commonest genotype is ll , which responds to infection by greatly reduced yield as well as mottling. The gene L , characteristic of Tabasco has, therefore, been transferred and selection for uniformity of type and yield is now in progress.

OIL PLANTS 633.85

210. SUN, V. G. 633.853.49:575.14

Effects of self-pollination in rape.

J. Amer. Soc. Agron. 1937 : 29 : 555-67.

Selfed seed was obtained from rape plants by bagging the inflorescences. It was found that the yield of seed was reduced as compared with that obtained from open pollination, but an adequate amount of seed for breeding purposes was obtained.

Progenies were grown for comparison from self-pollinated and open-pollinated seed. The progenies were rather severely winter-killed and the surviving plants were compared as to yield of seed, height and number of inflorescences per plant. It was found that inbreeding adversely affected yield of seed per plant, but no effect was detected on the other two characters. Some of the lines, however, yielded more than 45 gm. of seed per plant and these results from the first generation suggest that inbreeding is a promising mode of attack in rape breeding. Significant positive correlations were found between the three characters mentioned and it was found that yellow seed colour was associated with high yield of seed and high seed weight. No association was found between seed colour and height of plant or number of inflorescences.

211. BORKOVSKII, V. E. and

PODGURSKAJA, E. P.

633.853.55:575(47)

(Breeding work with castor oil).

Selektija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 1 : 28-34.

Experiments have shown that the lower flowers of an inflorescence are mainly self-pollinated and the upper flowers almost 100 per cent cross-pollinated. Artificial self-pollination could be effected without the least difficulty; on crossing inbred lines of the F_4 - F_8 generations some combinations gave heterosis, others little or no signs of it. Great variation was observed in all important characters, e.g. yield, oil content, husk percentage, time of maturity, amount of shedding, branching.

Based on hybridization work started in 1932, the dominance relationships of a number of characters are given. The Manchurian forms are promising as parents because of their earliness (75-85 days) and absence of shedding through capsule dehiscence. A spineless form has also been selected. Early maturity combined with good yield, high oil content and non-shedding is found also in the type *sanguineus*, which has the further advantages of disease and drought resistance, high oil content and firmly attached fruits which do not fall when over-ripe.

The forms *inermis* and *viridis* are also promising as parents, the former for its spineless fruits, unbranched habit suitable for mechanical harvesting, and high yield.

212.

MUTUL', I. F.

633.854.54(47)

633.854.54:575(47)

(Flax for oil—from the data of the variety trials for 1932-35).

Lenin Acad. Agric. Sci., Inst. Pl. Breed., Leningrad 1936 : Pp. 72.

This survey deals with the following points with reference to the development of the cultivation of linseed in the U.S.S.R.: the economic importance of the crop and its regional distribution in the U.S.S.R.; characteristics of the plant and the length of the vegetation period; oil content of different varieties, climatic requirements of the crop and cultural measures.

Much space is devoted to variety trials (including a note on methods of carrying them out) and the results obtained in various regions of the U.S.S.R.

The main varieties and selections of economic interest are mentioned and the importance of developing seed production as a means of extending the cultivation of high quality varieties of oil flax is indicated.

Breeding work must be developed. By hybridization and the proper application of breeding methods combined with a biological study of the plant, it should be possible to obtain from the varied existing types high-yielding and disease-resistant varieties with long straw.

213. KLIMENKO, K. 633.854.56:575.127.2
(Hybridization of the tung tree).
 Soviet Subtropics 1937 : 5 (33) : 87-90.

The highest yielding trees of *Aleurites cordata* and *A. Fordii* are used as parents and crossed with forms having the shortest vegetative period in order to combine these two qualities. Hybrids of *A. Fordii* x *A. cordata* have now been obtained in large numbers and display heterosis. The hybrids, which are described, mainly resemble *A. Fordii* in type but some, it is hoped, will possess the earliness characteristic of *A. cordata* and thus be very valuable industrially. They have been shewn to be more vigorous photosynthetically than the parents. The reciprocal hybrids, which are also described, are nearly without heterosis and in general less interesting.

214. KHUTSISHVILI, G. Z. 633.854.56:577.8:575.42
(Sexual forms of the tung tree and their economical value).
 Soviet Subtropics 1937 : 4 (32) : 18-32.

Fruit production in each year from planting was studied in a number of different sex forms of *Aleurites cordata* and *A. Fordii* and the results are reported. The yields of different trees of *A. cordata* in the plantations in the Batum region were also studied and the best trees kept as mother trees. The highest yields were given by the female dioecious form, especially the late flowering type. The hermaphrodite form also gives high yields. In *A. Fordii* the cluster type, containing a high proportion of female flowers in the inflorescence, gave the best yields. The best types are being multiplied by vegetative reproduction, the methods of which are described.

215. PUSTOVOIT, V. 633.854.78:575(47)
(Results of work of the State Research Institute for oil crops on sunflower breeding).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 1 : 12-20.

Figures are given shewing the great superiority in yield of the sunflower resistant to *Orobanche cumana* race B when grown in infected soils. The best of these lines produced by the Rostov and Almavir breeding station are described. The quality of the resistant lines is now being improved by further breeding. Maternal inheritance of resistance has been obtained in a number of crosses.

At Krasnodar a direct correlation has been found between lateness of maturity and oil content, while husk percentage was not so correlated. Varieties improved in earliness, in oil content and yield and with low husk have been produced and figures are given shewing how these compare with the standard variety Kruglik A-41.

216. JAGODKIN, I. G. 633.854.78:575.14:575.125
(Application of the method of inbreeding and diallel crossing in sunflower growing).
 Selekcija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 1 : 21-27.

Although an unexpectedly high degree of self-fertility has been obtained in some of the inbred lines the yield from inbreeding is still unsatisfactory when compared with that from free pollination. Close-breeding (free pollination between plants of one inbred line) materially increases the amount of seed set. Diallel crossing, crossing each inbred line with every other, or with the best only, is now being applied to sunflowers. Among the inbred lines available are lines with 100 per cent resistance to *Orobanche* A, with 100 per cent resistance to the sunflower moth, high rust resistance, uniform growth and flowering, upright inflorescence, low husk percentage (in some as low as 21 per cent) high oil content of kernel; lines with high resistance to *Orobanche* B are now being isolated.

Diallel crossing with these lines has produced hybrids greatly exceeding the parents and even the standard varieties in vigour and seed production, as well as combining the desirable qualities of the parents. Some combinations were particularly favourable and it is hoped to use them for the production of crossed seed in the manner used for maize.

217. GOVAERT, R. 633.855.34:581.162.3:578.08
 Bijdrage tot de studie van de veredeling van den Afrikaanschen Oliepalm
 (*Elaeis guineensis* JACQ.). Gekontroleerde kunstmatige zelfbestuiving.
 [On the study of the improvement of the African oil palm (*E.
 guineensis* JACQ.). Controlled artificial self-pollination].
 Kolon. Landbouwdagen 1933 : June : Pp. 4.

Details of floral biology in *E. guineensis* are given with a full description of the various operations involved in the controlled pollination of a number of trees of the Tenera type, e.g. the selection of suitable material, bagging, pollen collection, etc.

RUBBER PLANTS 633.91

218. GAIN, E. 633.912:581.48:575-18
 633.912:575.42
 Contribution à l'étude biométrique de la graine d'*Hevea brasiliensis* des
 plantations malaises. (A contribution to the biometric study of the
 seed of *H. brasiliensis* of the Malayan plantations).
 Ann. Sci. Nat. 1937 : 19 : Sér. 10 : 233-45.

Some observations are recorded on variations in pigmentation, weight and shape of the seeds of *H. brasiliensis* with indications of the possible value of biometric studies in selection work. Further studies should be made of seed variation in clones and of possible correlations with latex production.

219. KUPTSOV, A. I. 633.913:575(47)
 (The first selected varieties of guayula).
 Soviet Subtropics 1937 : 7 (35) : 35-43.

Investigation of the extensive collection of guayule brought from South America has shewn great variation to exist in the rubber content, the variety *angustifolium* being one of the richest. The regions where this variety is found are indicated. The first step in breeding was therefore to produce pure populations of this variety by inbreeding. Similar pure populations were made of varieties *argentata* and *crispata*, which are higher still in rubber content. The variety *angustifolium* so produced contained 6-7 per cent rubber and gave 69.3 kg. rubber per ha. in the first year. Yields of 83.8 kg. per ha. were obtained from *argentata* and 62 from *crispata*.

The size of the plant is another important factor determining yield. This varies in different lines but is always greater in the second and later years of growth, suggesting the desirability of perennial cultivation. This is prevented by the lack of hardy forms in *Parthenium argentatum* and a possible remedy for this is by crossing with the related species *P. incanum*.

The forms having the highest rubber content tend to have the lowest germinating capacity of the seeds. This correlation is not absolute, however, and it should be possible to breed high-rubber forms that produce good seeds.

CAMPHOR PLANTS 633.956

220. VORONTSOV, V. E. 633.956:575.42
 (The camphor tree at the Batum region).
 Soviet Subtropics 1937 : 3 (31) : 57-62.

The camphor trees of the Batum region represent a rather pure population and are therefore useful for producing supplies of seed. Some hybrids are present among them but analyses of their seedlings shew that there is very little segregation as regards yield. The average content of camphor and oil was 1.33-1.65 per cent: certain segregates with as much as 2 per cent occurred, however, and these should serve as material for vegetative reproduction.

221. SNEGIREV, D. P. 633.956:581.192:575.127.2
(Changes in the chemical composition of essential oils brought about by hybridization).

Bull. Appl. Bot. Leningrad 1936 : Ser. III (15) : 245-74.

The chemical composition of the essential oil of *Ocimum canum* and *Ocimum gratissimum* and of the F₁ hybrids from the reciprocal crosses between these two species was determined and all were found to contain the same constituents. The F₂ hybrids on the other hand shewed, as compared with the parent forms, considerable differences in chemical composition though some F₂ plants approached relatively closely to the parent types. (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1185).

FRUIT TREES 634

222. ALEXEYEV, V. P. 634:575.127
 634.3:575(47)
(The methods of I. V. Michurin and T. D. Lysenko and prospects of the selection of citrus trees in the arid subtropics).
 Soviet Subtropics 1937 : 1 (29) : 35-46.

Within the genus *Citrus* there occurs the widest possible variation in temperature, moisture and soil requirements and in time of bearing, some pomelo hybrids having flowered within 5-6 months of planting. This variation opens up great possibilities in breeding. *Poncirus trifoliata* for instance is frost-resistant on account of its deciduous habit and winter rest: *Fremocitrus glauca* is hardy because of its xerophytic habit and concentrated sap whilst the tropical halophytic group proves to be hardy owing to the high osmotic concentration of the cells. By crossing members of these different groups on the lines adopted by Michurin and Lysenko still greater potentialities for hardiness should be present in the hybrids, which should also be more tolerant of the other unfavourable growth conditions of the arid Soviet subtropics. Further crossing with cultivated types and the application of Michurin's methods of nurture should give rise to high-quality hardy forms.

Similarly greater earliness should be attained by combining different phasic types.

Attention is to be given to the effect of nurture on the characters of the seedlings, a line which, it is thought, has been neglected by the American workers.

223. ZORIN, F. 634:575.127
(Experiments of Kh. Nipport).
 Soviet Subtropics 1937 : 7 (35) : p. 115.

Kh. Nipport has applied Michurin's methods in pollinating over two thousand peach flowers and has produced also very high-yielding trees of satsuma and other fruits.

224. GUMENIUK, I. P. and 634:575.127(47.7)
 PODUFALY, T. I.
(Methods and achievements of I. V. Michurin and their utilization in the Ukraine).
 J. Inst. Bot. Acad. Sci. Ukraine 1936 : No. 10 (18) : 161-70.

The authors survey briefly Michurin's achievements in fruit breeding and outline the theories he developed during his experimental work. He considered the genotype and phenotype to be the results of interactions of an hereditary basis and environmental conditions and regarded the latter as being of great importance in the evolution of plants. On the basis of these theories he developed the principle of biologically and geographically distant hybridization with the aid of which he developed his best varieties. He also emphasized the importance of controlling the environment and directing the development of hybrid seedlings. His methods are to be applied in the work of the Scientific Research Institutes for Tree and Small Fruit Culture in the Ukraine.

225. BLAKE, M. A. 634.11:575
Pomologists should not overlook the varietal problems in fruits.
 Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 1-4.

The wide importance of varietal problems is stressed, with special reference to apples.

226. LANTZ, H. L. 634.11:575(77.7)
Apple breeding : a list of crosses and number of trees growing in orchards and nurseries at Ames.

Trans. Iowa St. Hort. Soc. 1935 : 70 : 56-66.

Crossing work was carried on from 1906 to 1912 and from 1917 to 1928 and thousands of seedlings have been grown and extensive records taken. Studies are made on the inheritance of tree characteristics such as vigour, habit of growth, productivity and hardiness and of fruit characteristics such as size, colour, form, flesh, flavour, quality and season.

The Russian apples have proved valuable in breeding for hardiness. With regard to tree types, very good trees were produced by the parent varieties Antonovka, Pewaukee and Duchess (Cf. also "Plant Breeding Abstracts", Vol. VII, Abst. 277). In general it has been found that parent varieties of high quality such as Jonathan, Delicious, Ramsdell, Northern Spy, King David, McIntosh, Sharon and others transmit their desirable characteristics to their progeny.

The article concludes with the classified list of crosses.

227. WILCOX, A. N. and ANGELO, E. 634.11:575.11-181.12
Apple breeding studies II. Fruit shape.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 9-12.

Data are presented on fruit shape inheritance in the material previously studied for fruit colour (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 276). It is concluded that the tendency towards relative length and away from relative oblateness is transmitted most consistently by Delicious and Black Ben Davis and also to a certain extent by Grimes Golden. The parents which appear to be most effective in the opposite direction include Jonathan, King David, Potten Greening, Wealthy and Wolf River.

Seedlings with conic fruit appeared more frequently in progenies with fruits tending on the average to be long rather than oblate. Delicious x Okabena, Grimes Golden x Oldenburg and Oldenburg x Delicious produced more seedlings with conic fruit than King David x Oldenburg and Jonathan x Oldenburg.

As in the case of fruit colour the cross between Grimes Golden and Oldenburg was the only one to shew different results in reciprocals. There appeared to be a tendency towards maternal inheritance of fruit shape. The slight possibility of a mistake in pollinating Oldenburg by Grimes Golden cannot, however, be eliminated.

228. GARDNER, V. R. 634.11:575.255
A het[e]ro-chimeric apple sport and its vegetative progeny.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : p. 4. (Abst.)

A tree, apparently of the variety Northern Spy, growing in a Michigan orchard, produces fruits of great diversity in size, colour, shape and maturing season. Scions taken from this tree for grafting have given rise to a number of strains or types, sufficiently distinct to be regarded as varieties.

229. LINCOLN, F. B. and MCCANN, L. P. 634.11:576.356.5:576.312.35
Polyploidy in native species of *Malus*.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : p. 26.

Counts in root-tips from seedlings have shewn *M. ionensis* and *M. angustifolia* to be diploid ($2n = 34$), *M. lancifolia* and *M. bracteata* to be triploid and *M. platycarpa*, *M. glaucescens*, *M. glabrata* and *M. coronaria* tetraploid ($2n = 68$).

230. LATIMER, L. P. 634.11:581.162.5
 Self- and cross-pollination in the McIntosh apple and some of its hybrids. 634.11 McIntosh

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 19-21.

The ability of McIntosh and its seedlings Cortland, Melba, Early McIntosh, Milton and Macoun to pollinate themselves and each other was investigated. Starking was also used as pollinator for comparison.

No significant advantage can be attached to any of them as pollinators for McIntosh or its seedlings except that Early McIntosh does not pollinate Cortland satisfactorily.

McIntosh, Cortland, Milton and Macoun set only 1 to 3 per cent of the blossoming spurs on self-pollination but Melba set 22 per cent. Early McIntosh has not been used as female parent.

231. WARING, J. H. and 634.11-2.111-1.521.6:578.081
 HILBORN, M. T.
 Some observations and current studies of winter injury to apple.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 52-56.

The results of winter injury surveys in Maine are given. The severity of damage to commercially important varieties has led to a new emphasis being placed upon hardiness in the breeding work of the Maine Station. It has been found that artificial freezing followed by microscopic examination of sections of twigs for killing of parenchyma cells and occlusion of vessels, can be used to estimate winter-hardiness and this method is to be applied in the breeding work.

232. JANCKE, O. 634.11-2.7-1.521.6:575
 Ueber die Blutlausanfälligkeit von Apfelsorten, wilden Malusarten und -bastarden, sowie die Züchtung blutlausfester Edeläpfel und Unterlagen.
 (On susceptibility to woolly aphid in apple varieties, wild species and hybrids of *Malus* and on the breeding of resistant pedigree apple varieties and stocks).

Phytopath. Z. 1937 : 10 : 184-96.

Tests of the collection of pedigree apples have been made for some years at the Naumburg experimental station and have shewn that only 6 of the 103 varieties (232 trees) tested are "immune" (i.e. giving no reaction) to artificial infection by woolly aphid, and 50 are only slightly susceptible. These results are compared with the findings of other investigators and possible factors explaining any conflicting conclusions are considered.

Breeding for resistance may be done by selection among seedlings of resistant cultivated varieties or by crossing such varieties or by introducing immunity from wild types. Artificial infection tests of the wild apple collection at Naumburg (79 species and their hybrids) shewed that 64 per cent of the 152 trees examined were resistant and of these 17 per cent may be regarded as immune. Here, however, as in the tests with pedigree varieties, the various trees belonging to a particular species or hybrid did not necessarily exhibit the same reaction and in selecting breeding material individual tree tests are essential.

Preliminary results of breeding work in progress at Naumburg shews that crosses of resistant or immune pedigree varieties gave 64 per cent immune and 23 per cent resistant seedlings, whereas more or less resistant wild types crossed *inter se* gave 78 per cent immune and 18 per cent resistant progeny. The data so far obtained tend to indicate that resistance is correlated with dominant factors.

The necessity for breeding stocks resistant to woolly aphid is mentioned.

233. WILCOX, A. N. 634.13-2.111-1.521.6:575
 Material for the breeding of winter hardy pears.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 13-15.

Data are given on the hardiness of numerous varieties and introductions of pears at the Minnesota Fruit Breeding Farm. Of the seedlings produced on the Farm Nos. 3, 4, 5, 6 and 7 have proved very hardy and are believed to have Asiatic or Russian pears in their ancestry. Nine varieties from Norway and Sweden have shewn no injury in the winters of 1934 and 1935.

234.

KOSTINA, K. F.
(The apricot).634.21
634.21:575(47)

Suppl. 83. Bull. Appl. Bot. Leningrad 1936 : Pp. 291.

This monograph of nearly three hundred pages contains sections on the systematics and geographical distribution of the apricots, the history of their cultivation, the variation existing in regard to a number of important characters, and the breeding, cultivation and utilization of the crop, together with a chapter on the main diseases and pests.

In the section on breeding the work hitherto carried out in a number of different countries is summarized, on the basis partly of published work, partly of personal communication to the author; the Russian work consists mainly in the production of hardy forms, partly by crossing with wild species such as *Armeniaca sibirica*, *A. Davidiana*, *A. dasycarpa* and *A. manshurica* and partly by selection from seedlings of *A. vulgaris* and *A. dasycarpa* and other species. A number of varieties combining high commercial quality with frost resistance have also been obtained by selection. At various centres work on the production of winter-hardy and disease resistant forms is in progress; for the latter purpose, the plumcot, the Japanese plum, as well as the *Ussuriensis* plum, and hybrids of the Hansen plum are being used which also cross with the cultivated apricot. At the Ukraine Institute for Berry Fruit Culture, cold resistant and large fruited forms are being sought among the 50 hybrid seedlings obtained by pollinating the most cold resistant local apricot seedlings with pollen from the Kaščenko apricot and *Prunus spinosa* L. Since 1935 the cross of apricot with *Cerasus Besseyi* is being tried.

In contrast to the more or less disconnected research on the synthetic breeding of apricots, in countries where cultivation of this fruit has long been practised, mass selection has improved the genotype as compared with the wild type, resulting in an accumulation of desirable characters including those which go to make up fruit quality.

To facilitate their use in future breeding work a description of the world types of the apricot is given with notes on their botanical and economic features and certain main groups, including the plumcot hybrid forms, are formulated, with information on their biology, disease and frost resistance, breeding value, etc.

The haploid number of chromosomes for *A. vulgaris* is given as 8 but Okabe's discovery of a triploid variety of *A. mume* is recorded. The facility with which *A. vulgaris* crosses with other apricots is indicated by reference to Michurin's hybrids between that species and *A. sibirica* and *A. manshurica*. The findings of Burbank and other workers on apricot x plum crosses and the results of other investigators on crosses between *A. vulgaris* and *Amgdalus communis* are mentioned.

Seed was obtained by the author in 1935 from a cross of *Pr. domestica* by the apricot, the resulting plants have 32 chromosomes and are intermediate in character.

The hybridity of the variety Black Alexandrinskii of the species *A. dasycarpa* has been demonstrated and also its complete self-sterility. The pollen of this variety though adequate in amount has a germination capacity of only 2-3 per cent and the seeds are generally underdeveloped and fail to germinate. Another form of *A. dasycarpa* has shewn satisfactory germination in Italy.

Numerous forms of *A. dasycarpa* occurring in various parts of the U.S.S.R. and elsewhere are mentioned. At least 7 or 8 forms are known which though differing morphologically and biologically from each other still represent intermediate types between the apricot and the plumcot and may therefore possibly be natural hybrids between these two fruits. A careful botanical and genetic investigation should clear up the origin and identity of the various types of *A. dasycarpa*.

An interesting group of varieties has been found in Central Asia which though they have glabrous, lustrous fruits have leaves, flowers and other fruit characters intermediate between the plumcot or plum and the apricot.

The findings of various American workers and of Michurin are cited to shew the potential value of distant hybridization in obtaining cold and disease resistant and late flowering forms. The question of dominance in such crosses is touched upon and Weldon's record of two apricot mutations (1928) is mentioned as shewing the resemblance between the apricot and the peach in this form of variation.

Existing data on sexual reproduction in the apricot is outlined with notes on self-fertile and self-sterile varieties. Self-sterility in many varieties is attributed to defective pollen, while low sets have in some varieties been found to be due to defective development of the pistil. Matters relating to seed production, viability and germination and to the fruiting of seedlings and grafting are mentioned.

Among the desiderata in the future breeding programme are:—Prolongation of the season during which ripe fruits are available by the production of commercially valuable varieties with a later flowering period, which would avoid damage by spring frosts and permit the extension of cultivation into other regions as well as ensuring a more regularly distributed harvest in existing regions; the production of frost resistant varieties for new regions of cultivation, of high quality types for manufacturing purposes and of forms with a sweet kernel as a by-product to be used as a substitute for almonds; self-fertile forms for commercial plantations and constant varieties as a source of material for planting and also for arid and woodland plantations,—non-grafted trees and especially those obtained from seed being hardier and longer lived than grafted trees.

Local contingencies should also be considered in improving the existing collection of varieties, e.g. the need for increasing the size of the fruit, the acidity and the fragrance of the Central Asiatic and Caucasian varieties and for developing varieties with firmly adhering fruits for other regions where high winds prevail.

The necessary material for this programme of improvement should be obtained firstly by introducing varieties from other countries and using existing types from Central Asia and Caucasia, and secondly by suitable crosses with desirable types. A list of such types is given, classed in ecological and geographical groups and suitable forms with which they may be crossed are enumerated with notes on their various economic and biological characteristics.

Most of the desired combinations can, it is hoped, be obtained by intervarietal or interspecific crosses, and inbreeding is suggested as a method worth testing for producing constant varieties. Intergeneric hybridization also offers possibilities as regards disease resistance and hardness. Finally, a systematic study of existing varieties of the apricot from the economic and biological aspect is regarded as essential.

An index of varieties and an extensive bibliography grouped under subjects and drawn from Russian, European and American literature conclude the monograph.

235. 634.22:576.16
 E. J. 634.22:575.127.2:576.356.5
 Hur ha våra odlade plommon (*Prunus domestica*) uppkommit? [How
 has our cultivated plum (*P. domestica*) originated?]
 Sverig. Pomol. Fören. Årsskr. 1937 : 38 : p. 115.

A short note on the work of Crane and Lawrence (see "Plant Breeding Abstracts", Vol. I, Abst. 465) and of Rybin (see "Plant Breeding Abstracts", Vol. VI, Abst. 1363) in tracing the origin of *P. domestica* to a cross between *P. spinosa* and *P. cerasifera* with subsequent chromosome doubling.

236. 634.22:581.162.5:581.162.3
 RUDLOFF, C. F. and
 SCHANDERL, H.
 Befruchtungsbilologische Studien an Zwetschen, Pflaumen, Mirabellen und
 Reineclauden. II. (Studies in the biology of pollination in plums,
 mirabelles and greengages II).
 Gartenbauwiss. 1937 : 10 : 669-87.

In the course of this study (Cf. "Plant Breeding Abstracts", Vol IV, Abst. 234), which now covers a period of seven years, data on the pollination of 210,661 flowers of the fruits in question have been collected. Of the 65 varieties tested 39 have proved definitely self-sterile, 4 partially self-fertile and 22 definitely self-fertile.

Suitable pollinators were discovered for a few of the self-sterile varieties. The yield of self-fertile varieties was not, however, increased by the use of pollen of a different variety and for all practical purposes the Common Zwetsche appears to set only with pollen of its own kind.

In 1934 the self-sterile plum Montfort set 7 fruits (2·3 per cent) on self-pollination, which were smaller than normal and contained lighter stones than fruits from open pollination.

In germination tests of pollen, stigmatic tissue of its own variety should be added to the culture—a measure which is usually more effective with self-fertile varieties than with self-sterile varieties.

Productivity was higher in the small-fruited varieties than in the large fruited ones—a fact which should be remembered in estimating the results of cross-pollination experiments.

237. SEFICK, H. J. and
BLAKE, M. A. 634.25:581.47
The external characters of green fruits of the peach are valuable aids in varietal identification.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 5–8.

Characters of the green fruit at the pit-hardening stage which can be used in distinguishing peach varieties are described. They are general form, base, apex and apex tip, pubescence and size of fruit.

CITRUS FRUITS 634.3

238. G-v. 634.3:575.12
(A new variety of orange).
Soviet Subtropics 1937 : 3 (31) : p. 123.

An orange combining the seedlessness of the Washington Navel with the agreeable flavour of the blood orange and the fruit form of the Satsuma is described.

239. ESINOVSKAJA, V. N. 634.3:575.12:581.162:631.541
(Fruiting of hybrids).
Soviet Subtropics 1937 : 2 (30) : p. 114.

A hybrid of the citron with *C. ponderosa*, grafted on to *C. Unshiu*, was induced to flower and produce fruits after one-and-a-half years, as compared with 5–6 years for rooted seedlings.

240. DANIEL, E. P. and
RUTHERFORD, M. B. 634.3:575.127.2:577.16
Ascorbic acid content of a number of citrus fruits.
J. Agric. Res. 1937 : 54 : 689–93.

The ascorbic acid values of freshly picked fruits of the following types were determined by the 2,6 dichlorophenolindophenol titration method: 8 varieties of oranges, 3 varieties of grapefruit, 2 varieties of tangerines, 8 varieties of tangelos (grapefruit-tangerine hybrid, see "Plant Breeding Abstracts", Vol. II, Abst. 694), one variety each of tangor (tangerine-orange hybrid) lemon, lime, limequat (lime-kumquat hybrid) and the Perrine lime (lemon-lime hybrid).

241. RUGGIERI, G. 634.3:575.252
Le variazioni gemmarie in agrumicoltura. Primo contributo alla conoscenza di esse sull'arancio Tarocco. **(Bud variations in citrus cultivation. A first contribution to the knowledge of them in the Tarocco orange).**

Nuovi Ann. Minist. Agric. 1937 : 17 : 85–102.

The results of other workers on bud sports in oranges are reviewed with some fullness after which the author presents his own observations on a variety of orange known as Tarocco. The bud variations described are a form with a fruit of inferior quality which bred true when selfed, one with a markedly elongated leaf, a third with a flattened type of fruit and one with an elongated fruit.

Sectorial chimaeras were also noted.

242. KLIMENKO, A. 634.3:578.082:575.12
(Sowing citrus seeds in open ground).
 Soviet Subtropics 1937 : 4 (32) : 75-76.

Experiments have shewn it to be quite possible to sow hybrid seeds of lemon, orange and pomelo in the open without injury to the young seedlings.

243. KLIMENKO, V. K. 634.3:578.088.1
 633.854.56:578.088.1
(Biochemical method of citrus and tung tree selection).
 Soviet Subtropics 1937 : 3 (31) : 75-76.

By treating the aqueous extract of powdered leaves of citrus trees with drops of potassium hydroxide, copper sulphate and Almen's reagent, colorations characteristic for each different species were produced, making it possible to distinguish the species in the absence of fruit and to make deductions as to the probable parentage of hybrids. Similar reactions of the extract of tung leaves with methylene blue enable the male plants of *A. cordata* to be distinguished from the female plants.

244. LAPIN, V. K. 634.3:581.163:576.356.5
 634.321-1.541.11:581.163
(Concerning the genotypic homogeneous stock for the citrus trees).
 Soviet Subtropics 1937 : 2 (30) : 24-27.

Apomictic seedlings of *Poncirus trifoliata*, and also of *Citrus deliciosa*, contained 3.40-3.68 per cent of tetraploid individuals. These can be distinguished by their broader leaves with pronounced anthocyanin pigmentation. By removing the tetraploids a genetically homogenous population of apomictic seedlings for use as rootstocks can be obtained.

245. G.-v, G. 634.3-2.112-1.521.6:575.127
(Over-wintering of citrus hybrids).
 Soviet Subtropics 1937 : 5 (33) : p. 121.

Mention is made of a number of citrus hybrids, interspecific and intraspecific, which withstood a frost of -8° C. undamaged.

246. LACARELLE, A. and 634.322 Clementine
 MIEDZYRZECKI, Ch. 634.322:581.48-184
 Nouvelle contribution à l'étude du Clémentinier au Maroc. **(A further contribution to the study of the Clementine in Morocco).**
 Terre Marocaine 1937 : Pp. 22.

In continuation of the work already reviewed (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1381), further experiments confirmed the fact that the seedless condition is the result of self-pollination. The presence of bees to effect pollination is necessary if a good yield is to be maintained.

The fruit is described in some detail and practical hints are given for the cultivation of the tree.

NUTS 634.5

247. GABLE, J. B. 634.5:575
Breeding nut trees.
 Rep. Proc. 27th Annu. Mtg. Nth. Nut Gr. Ass., Geneva, N.Y. 1936 : 79-82.

The author recommends intercrossing the best named varieties and then intercrossing the best hybrid seedlings in later generations as the method likely to give the best results. At the same time it must not be forgotten that varieties unsuitable for commercial cultivation may possess valuable characters which might be utilized in breeding.

248. GELLATLY, J. U. 634.5:575
Experimenting with nuts in British Columbia.
Rep. Proc. 27th Annu. Mtg. Nth. Nut Gr. Ass., Geneva, N.Y. 1936 : 121-24.
The author suggests that it should be possible to extract a hormone or analogous substance from bearing trees which would induce flowering and fruiting when injected into two-year-old seedlings, thus accelerating the process of breeding.
Microscopic examination of stored pollen shewed no visible deterioration until the third or fourth year of storage.
249. McCLINTOCK, J. A. 634.5:575
Saving America's nut resources.
Rep. Proc. 26th Annu. Mtg. Nth. Nut Gr. Ass., Ind. 1935 : p. 42.
Selection from local material is recommended, to obtain well-adapted varieties.
250. SLATE, G. L. 634.5:575
Suggestions for the breeding of nut trees.
Rep. Proc. 26th Annu. Mtg. Nth. Nut Gr. Ass., Ind. 1935 : 36-41.
In describing the methods of breeding, the author recommends testing a number of crosses to see which give the highest proportion of valuable seedlings and then repeating these crosses on a larger scale.
He enumerates some of the points in respect of which improvement is desirable.
251. SMITH, G. L. 634.5:575
Experimental work in grafting and breeding nut trees.
Rep. Proc. 27th Annu. Mtg. Nth. Nut Gr. Ass., Geneva, N.Y. 1936 : 52-57.
The author appeals for a co-operative effort in nut breeding and makes some suggestions, including the use of interspecific crosses among the different hickories and pecans.
252. GELLATLY, J. U. 634.5:575.12:578.08
Working with nuts in British Columbia.
Rep. Proc. 26th Annu. Mtg. Nth. Nut Gr. Ass., Ind. 1935 : 110-13.
In his nut-breeding work the author uses pollen stored over quicklime at room temperature and reports success in pollination even after two years storage.
253. REED, C. A. 634.51:575.127.2
Natural walnut hybrids in the East.
Rep. Proc. 27th Annu. Mtg. Nth. Nut Gr. Ass., Geneva, N.Y. 1936 : 30-40.
Examples of trees from the following crosses, natural or artificial, are described: *Juglans regia* x *J. nigra*, *J. nigra* x *J. cinerea*, *J. sieboldiana* x *J. regia*, *J. sieboldiana* x *J. cinerea* and *J. nigra* x *J. regia*. A cross *J. sieboldiana* x *J. nigra* is also mentioned as well as some uncertain hybrids.
Up to the present nothing of great horticultural value has been produced in the eastern U.S.A. by walnut hybridization, but the author suggests that valuable new forms might be obtained in this way.
254. CLAPPER, R. B. and GRAVATT, G. F. 634.53-2.4-1.521.6(73)
Status of work with blight-resistant chestnuts.
Rep. Proc. 27th Annu. Mtg. Nth. Nut Gr. Ass., Geneva, N.Y. 1936 : 58-61.
In the breeding of blight-resistant chestnuts at Bell, Maryland the following Asiatic species are being used as well as the American chestnut and chinquapin: the Chinese hairy chestnut, *Castanea mollissima*; the Chinese timber chinquapin, *C. Henryi*; the Chinese dwarf chinquapin, *C. sequina*; the Japanese chestnut, *C. crenata*. The self-sterility of most varieties of chestnut makes it necessary to obtain second generation progeny by natural or controlled intercrossing of F₁ hybrids or by back-crossing.
Difficulties are also introduced in testing for resistance by the fact that trees are liable to be killed or weakened by other agencies such as other fungous diseases, cold and vermin.

255. ZIMMERMAN, G. A. 634.53-2.42-1.521.6:575

A further report on induced immunity to chestnut blight.

Rep. Proc. 27th Annu. Mtg. Nth. Nut Gr. Ass., Geneva, N.Y. 1936 : 90-94.

By injecting with a vaccine the author claims to be able to induce immunity to blight in chestnuts and that this immunity is inherited.

256. SLATE, G. L. 634.54:575(74.7)

The filbert breeding project at Geneva.

Rep. Proc. 27th Annu. Mtg. Nth. Nut Gr. Ass., Geneva, N.Y. 1936 : 62-63.

A collection of about 120 species and varieties of *Corylus* has been built up at the New York Agricultural Experiment Station, Geneva. Several years of observation shewed that breeding work would be necessary to produce satisfactory varieties and crosses were made in 1930, 1931, 1932 and 1933; in addition 535 seedlings from crosses made by C. A. Reed between Rush and several varieties of *C. avellana* were obtained. In all 1,997 filbert seedlings of known parentage are being grown. A list of the crosses is given.

The object of the breeding work is the development of a series of varieties, similar in nut characters, that will bear heavy crops of nuts equal or superior to the present-day varieties in size, quality, appearance and husking qualities. Special attention is paid to hardiness in catkins and wood.

257. PEEBLES, R. H. and
HOPE, C. 634.574:575.183

The influence of different pollens on the development of the pistache nut.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 29-32.

Different flower clusters of *Pistacia vera* were pollinated with pollen from *P. atlantica*, *P. chinensis* and an unknown hybrid. Differences were subsequently found in time of ripening, percentage of self-splitting nuts and length of entire fruit, but not in length of hulled nuts.

258. 634.58(47)

PIROŽNIKOVA, M. F. 634.58:575(47)
(*Arachis* in the U.S.S.R. —from the data of the State Trials for
1929-35).

Lenin Acad. Agric. Sci., Inst. Pl. Breed., Leningrad 1936 : Pp. 72.

This monograph deals with the economic importance of *Arachis*, the world production of it, with a short history of its cultivation in the U.S.S.R., a description of the groundnut and its types and varieties with their morphological and biological characters, and the economic criteria used in determining the value of the different types. The pamphlet also contains sections on the quality of seed of forms of different geographical origin and from different varieties, the chemical properties of the plant and its requirements as regards heat and moisture, cultural measures and extensive data on variety trials in various regions of the U.S.S.R.

Among the main aims in breeding forms suitable for the U.S.S.R. are earliness and drought resistance, both of which are important if groundnut cultivation is to be extended northwards. Disease resistance, high oil content, high protein content and the production of a plant suitable to mechanical harvesting must also be considered by Russian plant breeders.

The production of pure seed should also receive attention, with special reference to the successful selections bred by various stations and the breeding stations should ensure that new forms are tested in the comparative State trials and under agricultural conditions too.

There is a bibliography.

259. BEATTIE, J. H.,
BOSWELL, V. R. and
BATTEN, E. T. 634.58-1.421

Plot and plant variation in Virginia peanuts.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 586-89.

Based on uniformity trials, a plot size of 300 square feet is recommended, preferably in the form of five or six 20-foot rows $2\frac{1}{2}$ to 3 feet apart.

The variability of single plant yields in 20-foot rows with the plants spaced about a foot apart in the rows was very great. Yield was not correlated with stand, but variability shewed a small but significant positive correlation with stand. When low variability of individual plant yields is important it is therefore recommended that the plants be spaced 18 to 20 inches to reduce competition.

Small but significant differences in variability were observed in some pure lines. The best commercial stocks were no more variable than certain known pure lines.

PALMACEOUS AND OTHER FRUITS 634.6

260. 634.653-1.524.2(72)

SHAMEL, A. D.

634.653 Fuerte

The parent Fuerte avocado. Three quarters of California avocado industry traces to Mexican tree.

J. Hered. 1937 : 28 : 181-82.

The parent tree at Atlixco, Mexico from which the Fuerte variety is derived, is described. The author suggests that a systematic examination of the seedling trees in selected districts of Mexico would lead to the discovery of forms of value to avocado growers in California and mentions a summer bearing tree growing in the same garden.

SMALL BUSH FRUITS 634.7

261. 634.75:575-181

WALDO, G. F.

634.75-2.484-1.521.6

Inheritance of size of plants and resistance to *Rhizoctonia* in strawberries.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : p. 340. (Abst.)

Crosses involving parents largely of *Fragaria chiloensis* parentage (e.g. Ettersburg 121) generally give the largest plants, while crosses between varieties not of *F. chiloensis* parentage generally gave smaller seedlings. The influence of *Rhizoctonia* in the soil on the percentage of large plants was more marked in crosses of the latter type than in the former.

262. MILLER, J. C. 634.75-2.4-1.521.6:575(76.3)

Methods of strawberry breeding in Louisiana.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 339-40.

The variety Klondike is the most popular in Louisiana. Improvements which are to be desired are greater resistance to leaf spot (*Mycosphaerella fragariae*) and scorch (*Diplocarpon earliana*) and a sweeter flavour.

Varieties known to have any resistance to the above diseases were collected. The parents used so far are Klondike, Missionary, Aroma, Howard 17 (Premier) and Blakemore. Crosses between the better seedlings and back-crosses to parents have also been made.

The seedlings remain in the nursery for one year. During their first year fruiting test in the field they are sprayed with a spore suspension of the two fungi. Most of the seedlings are eliminated in this year, 2 to 5 per cent being retained for a second year's study, comprising yield studies, quality analyses, co-operative field studies with growers and trial shipments. The best are retained for further testing.

VITICULTURE 634.8

263. STUMMER, A. and

FRIMMEL, F.

634.835:575(43.72)

Bericht über die Rebenzüchtungsarbeiten des Jahres 1936. (Report on the work of vine breeding in the year 1936).

Verlautb. dtsch. Sekt. mähr. Landeskulturrat 1937 : 15 : Nr. 3 : Pp. 3.

Work on the inheritance of long stem of the bunches is being continued (Cf. "Plant Breeding Abstracts", Vol. IV, Abst. 782 and Vol. VI, Abst. 645). The severe outbreak of *Peronospora* enabled fresh observations to be made and shewed that the stocks of Wildbacher blau chosen

on the basis of artificial infection experiments, when protected by means of Bordeaux mixture, remained free from infection.

The form of sexual expression, whether hermaphrodite, female or male, of a number of seedlings of *vinifera* crosses and selfings and of French-American hybrids is recorded. Tables are appended shewing the results of crosses and of selfings and records of a number of mutations are given.

264. WELLINGTON, R. 634.835:575(74.4)
Breeding hardy muscat grapes.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 421-25.

The available data from the New York Agricultural Experiment Station on the progenies of some 21 crosses involving the variety Muscat Hamburg are given. In all, 85 muscat-flavoured seedlings have been obtained, 13 of which are being propagated for an extensive test. The variety Golden Muscat (Muscat Hamburg x Diamond) was sent out for a trial in 1927. It is expected that before long several hardy muscat grapes will be available to growers in the eastern United States.

265. STOUT, A. B. 634.835:581.163:575(74.7)
Breeding for hardy seedless grapes.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 416-20.

A survey of the crosses made and the results in the breeding work at the New York State Agricultural Experiment Station (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 322).

Used as pollen parents on hardy seeded grapes, the Corinth grapes, in which seedlessness involves both parthenocarpy and the abortion of all ovules, have given no seedless forms in the F_1 . About 2,500 seeds for F_2 progenies have been obtained and it is hoped that some individuals will be obtained with these two properties combined.

When the stenospermocarpic *Vitis vinifera* seedless grapes Sultanina Rose and Black Monukka are used as pollen parents on hardy seeded grapes, seedless and seeded forms are obtained in the F_1 . The best seedlings are used for further crosses among themselves and for back-crosses to the seedless parents. It is suggested that there may be a single main dominant factor *S* for stenospermy and that Sultanina Rose and Stout Seedless [(Triumph x Dutchess) x Sultanina Rose] are heterozygous for it.

Other results are given. In all about 250 combinations have been made, about 20,000 seeds obtained of which less than half germinated. About 1,000 seedlings have fruited and 84 are seedless or near-seedless. Of these about 20 are promising for commercial culture and several are being propagated for trial.

266. SNYDER, E. and HARMON, F. N. 634.835-1.541.5:575
Hastening the production of fruit in grape hybridizing work.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 426-27.

By taking buds from the young seedling and budding them into vigorous shoots of root-stocks or bearing vines, fruits have been obtained at Fresno, California 18 months after sowing the seeds in the greenhouse.

267. YEAGER, A. F. 634.835-2.111-1.521.6:575.127.2
Breeding hardy grapes.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 414-15.

In breeding hardy grapes for North Dakota promising seedlings have been obtained in the varied F_2 of crosses between native *Vitis vulpina* and the cultivated varieties Concord and Eclipse (*V. labrusca*).

The variety Beta has also been claimed to be a hybrid between these forms, but seedlings from it and from the very similar variety Alpha did not shew the segregation that would be expected if this were the case. It is suggested that they may represent a distinct species or perhaps a botanical variety of *V. vulpina*, as they both come from the same general region of Minnesota.

268.

KOLESNIK, L. V.

(The enzymatic activity of apples and grapes in relation to their resistance to *Eriosoma lanigerum* Hausm. and gallic phylloxera).

Bull. Appl. Bot. Leningrad 1936 : Ser. III (14) : 69-78.

634.835-2.7-1.521.6

634.11-2.7-1.521.6:577.15

These preliminary experiments have shewn that catalase, oxidase and peroxidase activity was high in varieties of vines resistant to the *fundatrix* type of *Phylloxera*, while in apples, a low degree of activity of these enzymes was correlated with immunity and resistance to woolly aphid. On the other hand, the catalase activity of vines resistant to the root gall producing type of *Phylloxera* was low.

Resistance in apples and in vines was apparently correlated with high amylase activity.

FORESTRY 634.9

269.

The Maria Moors Cabot Foundation for Botanical Research.

Science 1937 : 85 : 575-76.

634.97:575(73)

The income from the endowment is to be devoted by Harvard University to problems related to the breeding of forest trees.

E. M. East and K. Sax will study artificial hybridization and induced polyploidy in relation to the production of constant-breeding hybrids. K. V. Thimann will study vegetative propagation, especially of conifers, with a view to establishing clones of promising selections. P. R. Gast, of the Harvard Forest, in addition to studies on the effect of nutrients and solar radiation on tree growth, will have charge of the selection and propagation of the most promising strains of different trees.

270.

STAF, C. and

TEERINK, E.

De wintereik (*Quercus sessiliflora* Salisb.). [The sessile oak (*Q. sessiliflora* Salisb.)].

Tijdschr. Ned. Heidemaatsch. 1936 : 48 : 123-37 ; 168-88 ; 201-12.

634.972.1:575.12:575.242

634.972.1:575.22

The differences between *Quercus sessiliflora* Salisb. and *Q. robur* are discussed with observations on nomenclature and a tabular analysis of their main characteristics as regards bud, leaf, flower and fruit, accompanied by illustrations of the leaves and acorns.

Attention is directed to the existence of transition forms including hybrid types though the latter are not regarded as being so frequent as is generally supposed. Before any definite conclusions can be deduced from crosses between the two forms, the heritable characteristics of the hybrids must be carefully studied, so that it may be possible to determine whether a particular form is a hybrid, a modification or a mutation. In this connexion the importance of studies of variation and the need for experiments by artificial pollination are emphasized. No research has yet been done on the races of *Q. sessiliflora* whereas *Q. robur* has been the subject of long investigations resulting in the identification of several races and the accumulation of information on the question of provenance. Hauch's work (Cf. "Plant Breeding Abstracts", Vol. VI, p. 99) in Denmark and the work of other investigators on racial characteristics are referred to as well as Seitz's findings on "mutant" forms of the oak, which are stated to exhibit constant and heritable characters. Mention is also made of the Kannappel oak *Q. sessiliflora* (*robur*) *Kannappellii* (Schwerin) which was reported in 1923 as having sweet acorns. Later reports, however, shewed that only one such tree had been recorded and it did not yield acorns with the same flavour each year.

The rest of the paper deals with practical methods of distinguishing *Q. sessiliflora* and *Q. robur*, a brief historical account of the distribution of species of *Quercus*, the area of distribution, requirements as regards soil and climate, a comparison of the two species *sessiliflora* and *robur* from the standpoints of tree shape, growth, timber production and characteristics, and finally susceptibility to weather, insects and fungi.

The question of obtaining pure seed is discussed.

Relevant work is cited in the bibliography.

271.

SPRANGERS.

634.972.6:575.42(49.2)

634.972.6-1.531.12(49.2)

Een en ander over de teelt van berken. (**Notes on the cultivation of birch trees**).

Tijdschr. Ned. Heidemaatsch. 1937 : 49 : 191-96.

Attention is directed to the measures advocated in Germany for the improvement of the quality of birch trees and it is suggested that Holland should take similar steps to improve her birches. The two types *Betula verrucosa* (= *B. pendula* in the new nomenclature of the Dutch Forestry Association) and *B. pubescens* should be distinguished and seed selection from high quality mother trees indigenous to Holland should be practised. The dangers of neglecting the important question of provenance and the selection of suitable races as regards climate and disease resistance are mentioned.

According to German information, high quality trees can be found in both *B. verrucosa* and *B. pubescens*, seedlings from the former being suitable for poorer and drier soils.

The method to be used in seed collection, testing, germination capacity and sowing is outlined with a note on the prevention of fungous disease.

272.

FUNK, G.

634.973:575.061.633

Über weissbunte Keimlinge von Esche (*Fraxinus excelsior* L.). [**On variegated seedlings of the ash (*F. excelsior* L.)**].

Flora, Jena 1937 : 31 : 355-68.

An account is given of some new forms of leaf variegation observed in 8 seedlings, including a case of leaf striping or "sectorial variegation" which was often unilaterally exhibited. Most of the aberrant seedlings, which produced white summer leaves, are presumed to be homozygous recessive segregates from heterozygous but phenotypically normal mother trees. The sectorial variegation is thought to be possibly due to plastid mutation.

A comparison of the various types of segregation is included in a brief survey of previously recorded forms of variegation.

VEGETABLES 635

273.

HASKELL, R. J.

et al.

635-2-1.531

Sources of disease-resistant vegetable and flower seeds, 1936.

Ext. Serv. Bur. Pl. Ind., U.S. Dep. Agric. Washington, D.C. Pp. 41.

(Mimeographed).

The vegetable varieties, together with snapdragons and asters, are first listed with the disease to which they are said to be resistant and references are given to the seedsmen offering such seed.

274.

JONES, H. A. and

EMSWELLER, S. L.

635.25:581.162.51:575.12

A male-sterile onion.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 582-85.

A male sterile individual which could be propagated by bulbils was found in the variety Italian Red. The sterility was due to microspore abortion following hypertrophy of tapetal cells; its mode of inheritance has not yet been determined.

The progeny obtained from this plant provided an opportunity for producing hybrid seed in quantity and testing the possibilities of commercial application of this method of breeding. Crosses were therefore made between the male sterile line and two inbred lines and an open pollinated variety. The F_1 bulbs were in all cases heavier than those of the pollen parents and the non-bolting character of the male sterile line dominated over the tendency to bolt in the cooler localities, which was characteristic of the open-pollinated variety and one of the inbred lines.

275. LEVAN, A. 635.26:576.16:575.356.5
Cytological studies in the *Allium paniculatum* group.
 Hereditas, Lund 1937 : 23 : 317-70.

The species studied were the diploids ($2n = 16$) *A. paniculatum*, *A. pulchellum* and *A. flavum*, the triploid ($2n = 24$) *A. carinatum* and the tetraploid ($2n = 32$) *A. oleraceum*. Evidence is presented to shew that there are two polyploid series, *paniculatum* and *oleraceum* forming one while *pulchellum*, *flavum* and *carinatum* form another. The genomes are structurally very similar within each group, a condition for which the author proposes the term "auto-genomatic". The relation between the genomes of the two different groups could not be investigated as they are separated by a sterility barrier.

A tetraploid F_1 plant obtained by crossing two extreme types of *A. paniculatum* resembled *A. oleraceum* and the case is regarded as a synthesis of the latter species. Certain diploid and monosomic segregates obtained when *A. carinatum* was induced to set seed by removing the bulbils were to be identified with *A. pulchellum*.

In the natural species, the polyploids have bulbils and the diploids have not, but this relationship broke down in the experimental material.

276. MILLER, J. C. 635.34-2.19-1.521.6:575.11
 635.34:581.143.26:575.11
Some factors associated with puffy-headed cabbage.
 Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 495-97.

Puffy heads are produced when cabbages mature during cool weather, the condition being associated with a tendency to run to seed. Varieties differ in their susceptibility to this defect and Louisiana Copenhagen, which has been selected for compact heads, is the most resistant of the varieties tested.

A cross was made between two lines, one an inbred line of five generations, selected for compactness of head and the other selected for the head seeding character, closely associated with puffiness. Segregation occurred in the F_1 , giving rise to both parental and intermediate types. It would seem that the cause of puffy heads is a heterozygous condition and is brought into expression by growing the plants at a low temperature. The remedy is the selection of resistant strains.

277. TYUTIN, M. G. 635.6
 (*Solanum muricatum*).
 Soviet Subtropics 1937 : 5 (33) : 67-71.

S. muricatum, the Melon Pear, produces seedless fruits of high vitamin C content and good keeping capacity. The seedlessness is shewn to be due to parthenocarpy and fruit formation is stimulated by emasculation and still more by artificial self-pollination. Several varieties have been shewn to exist.

278. HAGIWARA, T. and 635.61:575.11
 KAMIMURA, K.
 [Genetic studies in *Cucumis*. (A preliminary note)].
 Jap. J. Genet. 1937 : 13 : 71-79.

The Japanese account of the work already reported. (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1071).

279. JAGGER, I. C. and 635.611-2.42-1.521.6:575(79.4)
 SCOTT, G. W. 635.611 Powdery Mildew Resistant Cantaloupe No. 45
Development of Powdery Mildew Resistant Cantaloupe No. 45.
 Circ. U.S. Dep. Agric. 1937 : No. 441 : Pp. 6, also
 Proc. Amer. Soc. Hort. Sci. 1936 : 34 : p. 576. (Abst.)

Some plants in a mixed variety obtained from India were found to be resistant to powdery mildew (*Erysiphe cichoracearum* DC.), but were of poor commercial quality. A resistant plant was crossed with the American variety Hale Best. Resistance was found to be due to a single dominant factor. An F_2 resistant selection was back-crossed with Hale Best and

by selection, with some measure of inbreeding, for a further eight generations, the new variety, Powdery Mildew Resistant Cantaloupe No. 45, was developed.

In addition to its mildew resistance it has good shipping qualities and in 1936 occupied nearly half the cantaloupe acreage of Imperial Valley, California, the region for which a mildew-resistant variety is needed.

280. ESELTINE, G. P. van

635.62:575.127.2

***Cucurbita* hybrids.**

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 577-81.

Another brief account of the author's interspecific hybrids in *Cucurbita* (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1072). A table shewing the successful crosses of other workers is given.

281. SINNOTT, E. W.

635.62:581.47:575.113.4-183

The relation of gene to character in quantitative inheritance.

Proc. Nat. Acad. Sci. Wash. 1937 : 23 : 224-27.

If the effects of multiple factors for a quantitative character such as size are arithmetically cumulative, the distribution of F_2 individuals will be symmetrical. If the interaction is such that the effects of the different genes are geometrically cumulative, the distribution will be skewed, positively if each successive genic increment has a progressively greater effect and negatively if smaller.

In 41 out of 43 F_2 populations from crosses between pure lines of *Cucurbita Pepo* differing in fruit weight, the distribution of the F_2 was positively skewed. The skewness disappeared when the values were plotted logarithmically. The different factors for fruit weight may therefore be thought of as each adding a definite percentage to what the rest of the genotype produces. This is in agreement with the developmental analysis of fruit growth, which suggests that fruit size is a resultant of several independent processes; the effects of genes controlling different processes will therefore be multiplied. The type of interaction postulated by Rasmusson, in which the visible effect of a certain factor is smaller the greater the number of factors acting in the same direction, may occur when independent genes affect the same process, but such cases are either rare or masked by the commoner type of interaction.

When the F_2 distributions were plotted logarithmically there was often a slight negative skewness and this seems to be related to the fact that the variation in the pure lines and F_1 progenies, where it is presumably environmental, is symmetrical. Skewness seems to be associated primarily with the variability resulting from genetic segregation.

282. INOUE, Y.

635.624:575.242-181.12

[On a mutation in the fruit form of *Cucurbita moschata* caused by a mutable gene. (A preliminary note)].

Jap. J. Genet. 1937 : 13 : 66-68.

A plant of Aizu Early Small pumpkin was discovered which produced fruits of two shapes, that characteristic of the variety (shape index 0.3-0.7) and oval (shape index 1.3-1.7). In the next generation fruits of these two types were found and also two new types, round (shape index 0.8-1.2) and long oval (shape index 1.8-2.2). Some of the plants in this generation again had mixed fruits. Similar results were obtained in the next generation and it was observed that the progeny of plants with a high shape index tended themselves to have a high index.

The variation is attributed to a mutable gene, but further investigation is needed to discover its method of working.

283. MACLINN, W. A.,

FELLERS, C. R. and

BUCK, R. E.

635.64:577.16:575

Tomato variety and strain differences in ascorbic acid (vitamin C) content.

Proc. Amer. Soc. Hort. Sci. 1936 : 34 : 543-52.

The vitamin C contents of 98 varieties and strains of tomatoes are given. It is suggested

that selection for high vitamin C content could readily be carried on, using the method of titrating with 2,6-dichlorophenolindophenol. No correlation between fruit size and vitamin C content was found (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 482).

284. YARNELL, S. H.,
FRIEND, W. H. and
WOOD, J. F. 635.64-2.1-1.521.6:575.11

Factors affecting the amount of puffing in tomatoes.

Bull. Tex. Agric. Exp. Sta. 1937 : No. 541 : Pp. 64.

After giving data on the influence of environmental factors, especially moisture and temperature, the author gives further evidence on the importance of hereditary factors (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 578).

The small-fruited varieties, with the exception of *Pomodora* have little or no puff. Varieties in increasing order of puffiness are Currant, Cherry, Plum and Pear.

The only practical solution of the problem appears to be the breeding of varieties with little puffing. The variation among varieties and strains and the segregation observed in crosses suggests that this is possible.

285. FRETS, G. P. and
WANROOY, G. 635.652:575.11-18
Die Erbllichkeit der Bohnenform und des Bohnengewichtes bei *Phaseolus vulgaris* IV. Die F_3 -Samengeneration (die F_2 -Pflanzen). [The inheritance of bean shape and of bean weight in *P. vulgaris* IV. The F_3 seed generation (the F_2 plants)].
Genetica 1937 : 19 : 156-87.

In continuation of the work, extensive data from the 1934 harvest are given on the dimensions and weight of the seeds of the two parental lines, the F_1 plants (F_2 seed) and the F_2 plants (F_3 seed). In a forthcoming paper the data from the 1935 and 1936 harvests are to be given and the results of the work summarized (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 530, Vol. VI, Abst. 301 and Vol. VII, Abst. 812).

286. PRAKKEN, R. 635.652:575.116
Linkage relations in *Phaseolus vulgaris* L.
Genetica 1937 : 19 : 242-72.

The linkage was tested of the factors for flower and seed-coat colour, stringiness and pod wall texture segregating in the cross between Fijne tros and Wagenaar (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 531). Apart from the absolute linkage between *c* and *m* postulated by the author to explain the mottling of the seed coat, the only case of linkage discovered was between *B-b*, a complementary factor for seed-coat colour, called the greenish-brown factor, and *St-st* the factor for stringiness. The cross-over value was 23.8 ± 1.27 in the F_2 and 27.9 ± 2.15 in the back-cross.

287. ATABEKOWA, A. J. 635.656:576.312.36:537.531
(On the effect of X-rays on the growth and development of peas).
Biologičeskii Žurnal (Biologicheskij Zhurnal) 1937 : 6 : 81-92.

Seed from a pure line of the variety of *Pisum sativum* called American Wonder was irradiated both dry and after steeping in water. Dosages from 50-1,000 r were given during periods ranging from 1 hr. 52 min. to 37 hrs. 24 min.

In root-tips of plants from irradiated air dry seeds, doses of 200 r and upwards—especially 350 and 450 r—resulted in the formation of a small number of binucleate and polyploid (including tetraploid) cells. The polyploid cells were found in vertical layers or forming

sectorial chimaeras. Other anomalies noted were: irregularities of division, root-tips comprising a mosaic of diploid, tetraploid and hexaploid complements, nuclei containing up to 5 (or even 7-8) nucleoli and the shortening of the chromosomes previously recorded (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 364).

In the root-tips of irradiated steeped seeds similar phenomena were found and, in this case were initiated by even the lowest dose 50 r. As before aberrations were frequent with 350 r, while with 450 and 550 instances of asynchronous mitosis were noted in addition.

Analysis of the peas obtained on plants raised from the irradiated seed receiving 250, 350 and 450 r shewed that polyploid chimaeras and polyploid plants were produced.

In the air dry series plants raised in pots from seed that had received a dose of 350 r shewed more luxuriant development and a higher number of pods than with other doses.

The foregoing data are taken as a demonstration of the generalized effect of X-rays and its persistence in the second generation. A similar effect was recorded in field experiments, the yield being estimated by weight in this case. The steeped seed, though inferior to the air dry series, shewed some increase in the weight of the yield of seed.

288.

ATABEKOWA, A.

635.656:576.356.5:537.531

635.656:576.356.5:581.04

Über die Bildung polyploider Sätze in somatischen Zellen. (**On the formation of polyploid sets in somatic cells**).

Genetica 1937 : 19 : 105-33.

In 70 root-tips from untreated pea seedlings only one tetraploid sector was found.

When seedlings were irradiated with X-rays, dosage 250 r, or seeds, with varying dosages up to 1,000 r, in addition to tetraploid, hexaploid and octoploid sectors there were found binucleate cells and also cells with two nucleated protoplasts each. Higher X-ray dosages, of 8,000 r and more caused more drastic anomalies, often resulting in the death of the cell. Tetraploid sectors were also produced when the seeds were soaked in dilute solution of corrosive sublimate and sodium sulphate.

289.

ZHURAVLEV, E. M.

635.656:581.192:575

(**Variation and inheritance of the protein content in pea grains**).

Bull. Appl. Bot. Leningrad 1936 : Ser. III (15) : 73-82.

Determinations of the percentage protein content in single peas of the Golden and American Wonder varieties and the hybrid between them disclosed a range of 19-26 for Golden and a range of 22-34 for American Wonder. The F_1 hybrids (F_2 seeds) shewed a still wider range of variation than the parent forms and segregated with a 1:2:1 ratio for low, intermediate and high protein content respectively. Evidence of the inheritance of high and low protein content was also obtained from data for two successive generations of plants raised from individual seeds of Golden. (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 366).

290.

KURGATNIKOV, M. M.

635.656:581.192:575.22

(**Qualitative changes in the protein and starch of pea seeds**).

Bull. Appl. Bot. Leningrad 1936 : Ser. III (15) : 83-109.

Based on studies of 12 different varieties of peas each grown in 3 different regions in the U.S.S.R. a detailed account is given of analyses of the chemical composition of various species, subspecies and other forms of *Pisum*. The relatively small role played by environment as compared with the genotype in determining the chemical composition of a variety is exemplified. Wrinkled (garden) peas are, however, cited as an exception, for in them their low sugar content is apparently determined by both genotype and environment. Under conditions of a continental climate the differences in chemical composition between the wrinkled and round type of peas are practically eliminated.

291. LAMPRECHT, H. 635.656:581.48:575.11.061.6
 Genstudien an *Pisum sativum* III. Über den Effekt des Genpaares *Gl-gl*.
 (Gene studies on *P. sativum* III. On the effect of the gene pair *Gl-gl*).
 Hereditas, Lund 1937 : 23 : 287-303.

It was found that a yellow ochre coloration of the part of the seed-coat in *Pisum sativum* lying over the radicle is caused by the recessive allelomorph *gl* in the presence of *A*. When this pair of factors was first provisionally postulated by H. and O. Tedin, it was suggested that it was linked with *B-b* and this is supported by the present investigation, inasmuch as *Gl-gl* was found to be independent of factors not carried in the *B* chromosome.

In the F_4 and F_5 of a cross being studied with respect to seven pairs of genes, *glgl* individuals occurred as mutants.

It was found that *glgl* individuals produced more seeds per plant than *Gl-*, possibly due to linkage with a factor for seed setting. The weight of 100 seeds was less in the *gl* parent line than in the *Gl* parent.

292. JONES, D. F. and
 SINGLETON, W. R. 635.67:575.12
Crossed sweet corn.

Bull. Conn. Agric. Exp. Sta. 1934 : No. 361 : 489-536.

After an account of the advantages of hybrid sweet corn descriptions are given of some of the hybrids. There follows a detailed account of the technique and a discussion of the different types of crosses.

BOOK REVIEWS

PEKRUN, R.

43:030.8

Das Deutsche Wort—Rechtschreibung und Erklärung des deutschen Wortschatzes sowie der Fremdwörter. Nach den amtlichen Regeln bearbeitet. (**German vocabulary—correct orthography and explanation of the words in the German language as well as of foreign words. Compiled according to the official rules).**

Georg Dollheimer, Leipzig 1934 : RM. 3.80.† Pp. xvi + 1151.

This work has been produced with the avowed object of providing a comprehensive dictionary of the German language of the present day, compiled on similar lines to those upon which Chambers' 20th Century Dictionary of the English language is based. The main standard and other dictionaries German (and English) consulted by the author in his task total 25.

The 1,151 pages of "Das Deutsche Wort" contain, in addition to German, words from Teutonic and other languages, which have long been absorbed into the German tongue, also an enormous collection of foreign terms more recently acquired and in current use. Scientific terms from various branches of knowledge abound as well as technical words of all kinds.

The meanings are concisely defined in German and information is given on the pronunciation, accentuation, orthography, idioms, provincial usages, the origin of foreign terms, diminutives (where the stem changes) and to some extent on etymology.

The instructions in the section on orthography regarding the production of the various sounds of letters of the alphabet are based upon a knowledge of phonetics, but they would doubtless present little difficulty to a native speaker.

The material, including proper names of persons and places, is arranged in alphabetical order with the exception of compounds and derivatives and idioms which are grouped for convenience alphabetically under the key word. The gender and declension of all nouns are indicated with optional or less desirable forms where such exist; and similar useful information is given for the verbs terminating in -eln, -ern and -iert.

The difficulty of justly estimating the value of any dictionary of such a comprehensive nature as the one under review without first subjecting it to the acid test of constant and prolonged use, is obvious, nevertheless there should be no doubt that in compiling this comprehensive and yet compact volume, the author has done considerable service to German speaking peoples and those of other races who are familiar with that language. Its value as a reference book for authors, translators and all who wish to read or use correctly the German language of the present day must be considerable.

The work is well bound and attractively set out and the type is clear and well chosen to shew the distinctions necessary in a book of this kind.

RATHLEF, H. v.

575

Die Rose als Objekt der Züchtung. (**The rose as a subject for breeding).**

Gustav Fischer, Jena 1937 : RM. 4.50.† Pp. vii + 82. 3 tables. 6 illus.

The object of this little book is to give an account of genetics and cytology as they bear upon rose breeding, for the benefit of rose breeders and rose amateurs. The general account of the relevant material from genetics and cytology is given in the first part. It is much simplified, illustrated by reference to rose material and lays considerable stress on the cytology of inter-specific hybrids.

In the second part the different types of crosses are classified according to their chromosome behaviour, their characteristics described from the breeder's viewpoint and examples given. The third part is devoted to an alphabetical index of names of roses with information on synonymy, chromosome numbers, percentage of viable pollen and other points.

The book ends with a bibliography.

† 25 per cent reduction outside Germany.

SENGBUSCH, R. v.

575:633(43)

Pflanzenzüchtung und Rohstoffversorgung. (**Plant breeding and the supply of raw materials**).

(Probleme d. theoret. u. angew. Genetik und deren Grenzgebiete).

Georg Thieme, Leipzig 1937: RM. 6.† Pp. 131. 4 figs. 20 tables.

A further contribution to the series of volumes on "Problems of theoretical and applied genetics and related topics," the emphasis being in this case on applied. The book has a very topical interest, in view of Germany's efforts to make herself independent of external supplies and it is this struggle for self-sufficiency which is the underlying theme of the work.

The volume is divided into two parts. Part I deals with the balance between consumption on the one hand and production and import of raw materials on the other and with the factors which affect this balance, population, "Ersatz", nutrition, standard of living and the like. Special attention is of course devoted to organic raw materials, e.g. proteins, fats and plant fibres.

Part II gives an account of plant breeding methods, more particularly as applied in solving the problems raised in Part I. Illustrated by references to the author's work on lupins, it gives a clear picture of aims and principles, though characterized here and there by a close reticence about some of the details of the methods. Two very interesting chapters in this part review respectively the cost of breeding work in relation to its value to the nation and the tasks of German plant breeders.

The book concludes with an extensive bibliography and an index. Much useful information is conveniently displayed in the tables scattered throughout the text.

The main interest of the work derives from the picture it gives of how German economic policy affects her plant breeding activities.

GRÜNEBERG, H.

575.1

Elementary genetics.

E. & S. Livingstone, Edinburgh 1937: (Catechism Series) 1s. 6d. Pp. 87. 2 figs.

ANONYMOUS.

58

Botany.

E. & S. Livingstone, Edinburgh 1937: 4th ed. (Catechism Series) 1s. 6d. each part: Part I. 1-76. 30 figs. Part II. 77-164. 29-50 figs.

There are so many small textbooks giving an outline of genetics for beginners that one is apt to condemn a new one before reading it, on the score of redundancy. Dr. Grüneberg's book, however, is so much above the standard of the average work of this kind as to justify fully its publication.

Its chief merit is that, without being unduly complex, it succeeds in giving the beginner an account of genetics as it stands to-day rather than as it stood, say, in 1910. To mention two instances in illustration, we find crossing-over explained by chiasmotypy and partial sex linkage as well as absolute sex linkage mentioned. The account is, in general, accurate as well as clear and the application of the term "gamete" to pollen grains and ovules is presumably a deliberate simplification, to be justified on the grounds that the book is one of a series for medical students.

In its main outlines the book follows familiar lines, though the treatment is fresh. It concludes with a section on human genetics. The author has wisely not allowed himself to be too much restricted by the question and answer method required by the title of the series (Catechism Series) and the questions are used merely as sub-headings.

There is no index or bibliography.

The anonymous work on botany in the same series, in two parts, has recently been re-written and revised. It is written strictly in the form of a catechism and simply for use in preparing for examinations.

GÜNTHER, H.

575.2:519.24

Die Variabilität der Organismen und ihre Normgrenzen zugleich ein kurzer Leitfaden der Variationsstatistik. (**The variability of organisms and its normal limits, together with a short introduction to variation statistics.**)

Georg Thieme, Leipzig 1935 : RM. 7.† Pp. 132. 12 figs. 45 tables.

In this book the author develops statistical methods from the point of view of medical biometry. He rightly argues that for a quantitative examination of any organism it is not sufficient to know the measurements of an ideal specimen. This standard or average should be supplemented by a knowledge of the variation among like measurements, which is to be expected under certain well-defined conditions. It is only through this knowledge of the probable discrepancy from the standard that it is possible to distinguish between normal variation and cases of anomaly.

The point that such a definition of an anomaly will depend on the population under investigation is brought out very well by an example of the author: if for all men in a certain district (say) height and breadth are measured, and the height is divided by the breadth, this ratio will follow a certain frequency distribution. But on the average this ratio will be smaller for short men and larger for tall men, so that its distribution will be different for men sampled from different height classes. Whether a ratio, observed for a certain man, should be called an anomaly might thus depend on whether or not the individual should be regarded as a member of his height class.

Again, the definition of an anomaly will depend on the arbitrary level of the frequency with which anomalies are allowed to occur. The author, by studying the respective frequencies of a large number of *known* anomalies, has found that these are at most 4 per cent, thus independently confirming the usefulness of the 5 per cent level adopted in this country.

In dealing with statistical methods, the author gives a good account of standard calculations (such as that of the mean, the mean square deviation and the correlation coefficient), most of which are illustrated by various methods of graphical representation. Unfortunately, however, he does not consider certain results of modern statistical research. Thus a large number of statistics has been compiled and has been supplemented by recommendations of various scientists, whilst it would be interesting to judge objectively the comparative efficiency of these statistics in the light of the theory of maximum likelihood based on the study of the frequency curves.

The author also offers as a test for non-homogeneity a certain criterion: he compares the mean square deviation in a large sample (in terms of grouping units) with the variance of the symmetrical binomial, for which $n + 1$ is estimated by the ratio: Range of sample/length of grouping interval. Obviously such a criterion is systematically biased and does not seem to be an improvement on known methods.

Finally it should be added that the author frequently quotes statistical relations without stating the restrictive conditions under which they are valid. There are, for instance, distributions for which the median does *not* lie between mode and mean, although this relationship (called Fechner's Law of Position by the author) is known to hold for a large number of frequency curves.

H. O. H.

575.242

575.243

576.356

STUBBE, H.

Spontane und Strahleninduzierte Mutabilität. (**Spontaneous and radiation-induced mutability.**)

(Probleme d. theoret. u. angew. Genetik und deren Grenzgebiete).

Georg Thieme, Leipzig 1937 : RM. 6.80.† Pp. 190. 12 figs. 49 tables.

Dr Stubbe's contribution to the series on "Problems of theoretical and applied genetics and related topics" maintains the high standard of those already reviewed. It covers almost the same ground as a recent work on mutation by Timoféeff-Ressovsky (Cf. "Plant Breeding Abstracts", Vol. VII, p. 440). In addition it has a chapter on chromosome and genom mutations produced by short wave radiation, giving a concise and accurate account of induced

structural and numerical changes. We find, however, a mis-statement on p. 144, where the author states that a fragment with a spindle fibre attachment has never been found to unite with a similar fragment to form a chromosome with two spindle attachments. Dicentric chromosomes, as they are now called, are actually found if divisions are examined shortly after irradiation, as has been reported by Mather and Stone, by Riley, by Levan and by Husted, who studied them in some detail. The error is not serious, as the author goes on to say that such structure must ultimately be eliminated, as is, in fact, the case.

As indicated in the title the author confines himself to radiations and does not consider the effect of other agencies which have been reported to induce mutations.

There are an extensive bibliography and name and subject indexes.

58
575

STANFORD, E. E.

General and economic botany.

D. Appleton-Century Co. Inc., London & New York 1937 : 16s. 0d.

Pp. xxix + 675. 436 figs.

A first year textbook of botany, which derives its title from the fact that the author seeks to emphasize the significance of plants to mankind. There is no special section devoted to economic botany, but the economic aspect is brought out whenever possible.

The book may be roughly divided into two parts, the first dealing with general botany and the second with special botany. The approach to the subject is morphological rather than physiological. There is no section on plant physiology, the subject matter being treated in connexion with the appropriate organ, while the chapter on the seed plant and its environment contains much physiological material. The economic aspect is much to the fore in the three chapters in which the families of the Angiosperms are treated. The final chapter deals briefly with evolution, heredity and plant breeding.

There is an extensive index but no bibliography.

SOUÈGES, R.

581.143.24

La différenciation. Premier fascicule: I. Généralités. II. La différenciation cellulaire. (**Differentiation. Part I : I. Generalities. II. Cellular differentiation**).

Hermann & Cie, Paris 1936 : 18 fr. Pp. 86.

SOUÈGES, R.

La différenciation. Deuxième fascicule : III. La différenciation organique. (**Differentiation. Part II : III. Organic differentiation**).

Hermann & Cie, Paris 1936 : 20 fr. Pp. 139. 6 figs.

While frankly admitting its incompleteness, this brief treatise on differentiation takes a comprehensive view of the subject. Beginning with a discussion of the general principles the problems of differentiation within the cell are next considered. This leads on to organic differentiation to which the whole of the second part is devoted.

This survey of the causes, processes and main aspects of differentiation is not intended as a textbook for the student of natural science but rather to bring together the results of research on the subject and to shew where further investigation is needed. The standpoint is mainly morphological and the examples are taken from the plant world.

HILL, A. F.

581.6

Economic botany. A textbook of useful plants and plant products.

McGraw-Hill Publishing Co. Ltd., London 1937 : 24s. 0d. Pp. x + 592. 225 figs.

A textbook based on a half-year's course on economic plants given by the author.

After an introductory chapter on the importance and nature of plant products, there follows a section of nine chapters on industrial plants and plant products. Two chapters are devoted to drugs, seven to food plants and two to food adjuncts (beverages and spices, etc.). The appendix contains a systematic list of species discussed, which number nearly 1,000, a bibliography and an index.

A feature of the book is the large number of plants and products covered. It would be difficult to think of a useful plant of more than purely local importance which is not mentioned. This makes the book of considerable value for reference work. The space devoted to a plant bears little relation to its importance as a crop, an inevitable consequence of the wide scope of the book. It is illustrated mainly by well-chosen photographs and is a useful book, especially for the information it provides on the less familiar economic plants.

SCHISCHKIN, B. K.

581.9(47)

(Flora and systematics of the higher plants).

Trans. Bot. Inst. Acad. Sci. U.S.S.R. Moscow and Leningrad; 1933:

Ser. I: Vol 1: 17 roubles: Pp. 374. illus. 14 maps; 1936: Ser. I:

Vol. 2: 10 roubles: Pp. 319. illus.; 1936: Ser. I: Vol 3: 13 roubles:

Pp. 380. illus.

As a consequence of the reorganization of the Botanical Garden of the Academy of Sciences (of the U.S.S.R.) and its fusion with the Botanical Museum under the name of the Botanical Institute, both the "Acta Horti Petropolitani" and the Transactions of the Botanical Museum have ceased and their place has been taken by the Acta Instituti Botanici Academiae Scientiarum U.R.S.S. These Acta are to be published in four independent series and that section of the Institute concerned with systematics and phytogeography will issue its publications from time to time under the title *Flora et Systematica Plantae Vasculares*.

The present work, therefore, though termed a flora, does not consist in a systematic description of the plants of a single region or epoch. Each volume contains—in addition to contributions by various authors on the flora of particular regions or bearing on the systematic classification of certain plants—articles on palaeobotany and new genera or species or varieties new to certain localities. Most of the forms recorded and described were found within the U.S.S.R.

Among the contributions dealing with plants of some economic importance are in Vol. I: The systematics of the tribe *Hordeaceae*, by S. A. Nevskii; The systematics of *Apocynum venetum* L. by F. N. Russanov; Botanico-geographical survey of the maples in the U.S.S.R. in connexion with the history of the whole genus by A. I. Pojarkova; New and little-known species of the genus *Acer* L. by the same author—in Vol. II: A critical survey of the species of the genera *Ribes* and *Grossularia* occurring in the U.S.S.R. by A. I. Pojarkova—and in Vol. III: Two new species of *Pirus* L. by V. P. Maleev; The characteristics of the *Tragacantha* species of the Kopet-dag Range by A. G. Borissowa; New leguminous species from Tadjikistan, by the same author; A contribution to the question of the caoutchouc content of some species of the genus *Cousinia* Cass. by G. I. Igolkin. Some of the contributions have extensive bibliographies.

Vol. I has a table of contents in German and Vols. II and III (which are bound) have theirs in English and are also provided with useful alphabetical indexes of the plants referred to. All the volumes contain abstracts of the various papers in German or English.

CRAWFORD, D. L.

633/5-1.524(96.9)

Hawaii's crop parade. A review of useful products derived from the soil in the Hawaiian Islands, past and present.

Advertiser Publishing Co., Ltd. Honolulu, 1937: \$2.78. Pp. 305.

The main part of this book consists of an alphabetically arranged review of all the plants and animals which have been used or tried for economic purposes in Hawaii, the object being to summarize past experience for the benefit of those concerned in the "diversification" of Hawaiian agriculture. An introductory chapter gives an historical outline of agriculture in Hawaii and at the end of the book there is an index of scientific names and a general index. While the work is primarily of local interest, it contains much that is of interest to those in other tropical islands and colonies who are seeking to introduce and develop new crops.

STUART, W.

633.491(73)

The potato. Its culture, uses, history and classification.

J. B. Lippincott Company, Chicago, Philadelphia, New York and London :

1937 : 4th ed. 12s. 6d. Pp. xv + 508. 267 figs. 4 pls.

This book, now published in a fourth revised edition, is a textbook on the cultivation of the potato in the United States. Part I, which represents the greater part of the book, is devoted to details of the cultural practices in use throughout the U.S.A., including diseases and pests and the industrial uses of the product. Part II begins with a brief account of the botany of the potato plant, and a chapter is given up to its origin and early history. The chapter on breeding and selection outlines the work of the nineteenth-century researches, particularly those of the U.S.A.—more modern methods, including species hybridization, are barely mentioned but the practical aspects of methods of selection are dealt with more fully. The concluding chapter gives a classification and description of commercial varieties.

BECKER, J.

634/5-1.8

Handbuch der Ernährung der gärtnerischen Kulturpflanzen. (**Handbook of the nutrition of horticultural plants**).

Paul Parey, Berlin 1937 : 2nd ed. RM. 19.80.† Pp. xi + 504. 178 figs. 11 pls.

The success of the first edition (Cf. "Plant Breeding Abstracts", Vol. III, p. 224) has led to the issue of a second edition only four years later.

Though the general plan has not been materially altered, new work up to the beginning of 1937 has been included. Parts have been rewritten and condensed so that the present volume is shorter by 70 pages. The new edition has been enriched by the addition of 11 coloured plates and 59 text figures.

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